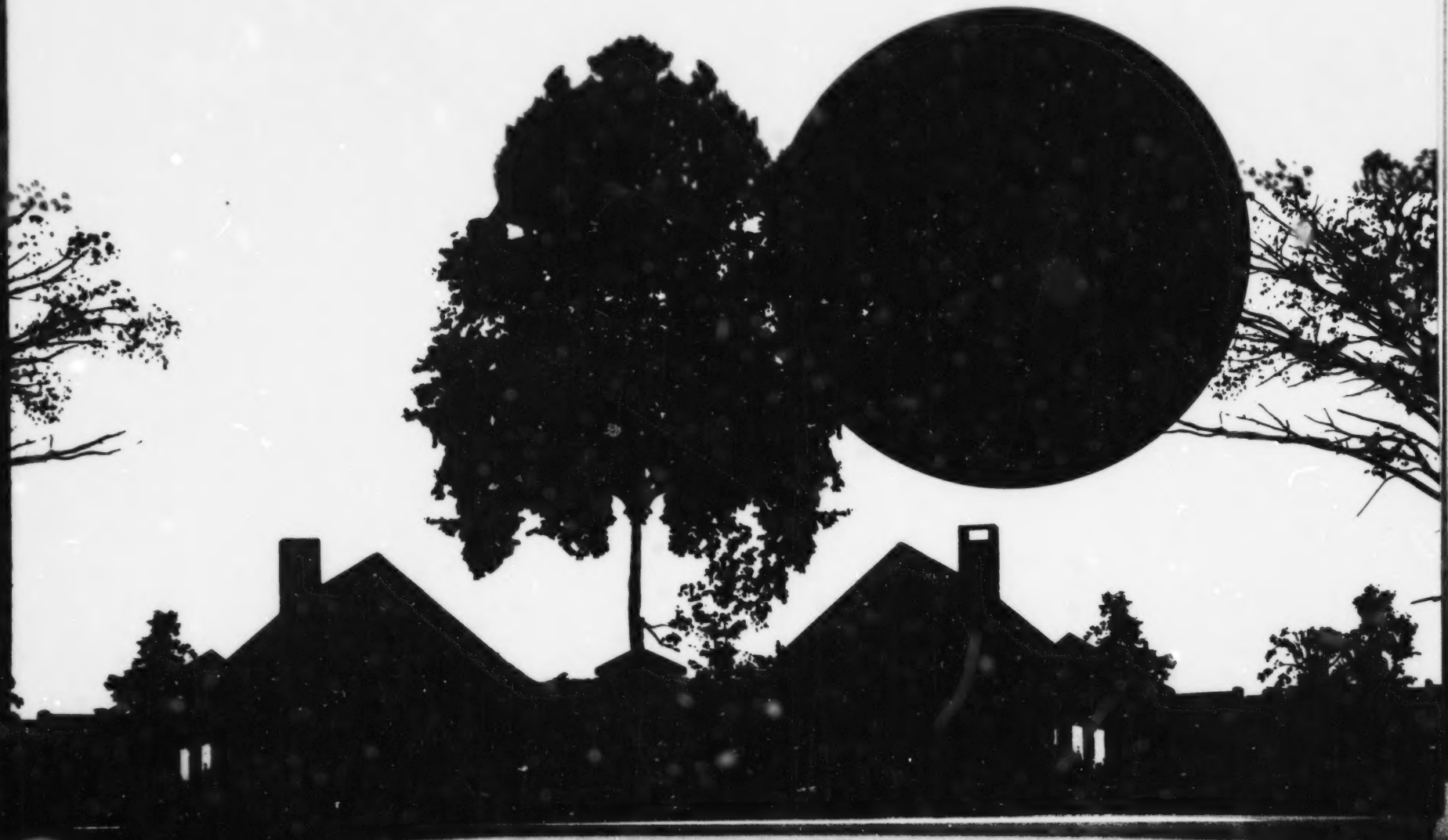
OPPORTUNITIES FOR

energy conservation

IN OTTAWA - CARLETON

The Municipal Role



OPPORTUNITIES FOR

energy conservation

IN OTTAWA - CARLETON

The Municipal Role

REGIONAL MUNICIPALITY OF OTTAWA - CARLETON
PLANNING DEPARTMENT

AUGUST, 1983

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Background 3
1.2 Structure 3

2.0 SUMMARY 7

3.0 BACKGROUND

3.1 What is the Energy Problem? 11
3.1.1 National Perspective 11
3.1.2 Provincial Perspective 13
3.1.3 The Regional Perspective 14
3.2 The Regional Response 16
3.2.1 Regional Implications of Energy Problem 16
3.2.2 Rationale for Regional Involvement 16
3.2.3 Regional Energy Goals 17

4.0 CONSERVATION - TRANSPORTATION AND PLANNING

4.1 Opportunities for Energy Conservation 21
4.2 Transportation Measures 23
4.2.1 Public Transit 23
4.2.2 Alternative Energy-efficient Travel Modes 24
4.2.3 Transportation Management 24
4.3 Land Use Planning Measures 26
4.3.1 Urban Form 26
4.3.2 Density 26
4.3.3. Mixed Uses 28
4.4 Subdivision Design 28
4.4.1 Transportation within Subdivisions 29
4.4.2 Climate Sensitive Subdivision Design 30
4.4.2.1 Factors 30
4.4.2.2 Planning Controls and Climate Sensitive Design ... 31
4.4.2.3 Implementation 33
4.5 Provision and Protection of Solar Access 35
4.5.1 Background 35
4.5.2 Planning Controls and Solar Access Protection 37
4.5.3 Implementation 39

5.0 OTHER ENERGY PROGRAMS

5.1 Recycling 43
5.2 Heat from Waste 43
5.3 District Heating 44
5.4 Wood Energy 45
5.5 Use of Underground Space 45
5.6 Implementation 46

6.0 COMMUNITY OUTREACH

6.1 Rationale for Community Outreach Programs 49
6.2 Approaches to Community Outreach 49

ANNEX A COUNCIL RESOLUTION OF 26 SEP 79 53
ANNEX B REGIONAL OFFICIAL PLAN AMENDMENT 34 57
ANNEX C TRANSIT SERVICING OF NEW RESIDENTIAL AREAS-
GUIDELINES FOR DEVELOPMENT 63

1. INTRODUCTION

1.1 Background

This report discusses opportunities and recommends actions for the Regional Municipality of Ottawa-Carleton (RMOC) in the area of energy conservation.

The study was prompted by a resolution of Regional Council on 26 Sept 79 (reproduced in Annex A). A draft version of the study was submitted to Regional Planning Committee in Dec 81. Planning Committee received the report and approved a recommended consultation process of informal discussions with area municipalities, government agencies, developers, energy-related associations, community associations, and the public.

Comments received from the consultation process did not require major revision of the draft report. Instead a separate report was submitted to Planning Committee in Aug 82 which described the consultation process, discussed the comments received and made final recommendations for Council action. [1] Most of the recommendations dealt with minor revisions and clarificatons to the proposed Regional Official Plan amendment which had been included in the draft report. Some changes to the text of the draft report were also indicated.

This final version of the report on "Opportunities for Energy Conservation in Ottawa-Carleton: The Municipal Role" contains (in Annex B) Regional Official Plan Amendment 34 as adopted by Regional Council in Nov 82. Amendment 34 was approved by the Minister of Municipal Affairs and Housing in May 83. Changes to the text arising from the Aug 82 report to Planning Committee have also been incorporated. A major rewrite of the report to reflect changes in economic circumstances, particularly in the world market for oil, and in the policies and programs of senior governments has not been undertaken.

1.2 Structure

This report is organized in six sections. Following this introduction, Section 2 is a summary of the entire report.

Section 3 presents background information on energy supply and demand from the national, provincial and regional perspectives. Having defined the problem and senior government policy responses, the section concludes with a discussion of energy policy goals for RMOC.

Section 4 deals with opportunities for the Region to directly affect energy use within the community. A discussion of energy use by the residential, commercial, industrial and transportation sectors is presented in order to identify areas for effective Regional involvement. In the identified areas of transportation and land use planning, specific measures to promote energy conservation are proposed.

Section 5 presents several other areas where the Region may play a direct role in energy conservation. These areas are related to Regional responsibilities but do not fall neatly into the sector by sector analysis of Section 3. Examples include recycling, generation of heat from waste, and district heating.

Section 6 discusses the rationale for and possible forms of a community outreach program which could indirectly affect energy use in the community.

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[1] Copies of the report to Planning Committee, dated 03 Aug 82, are available from the Policy and Program Division.

2. SUMMARY

For Canadians, energy problems concern cost and security of supply. Currently Canada imports approximately 25% of its oil requirements; this import requirement may rise to 40% in 1990 if energy conservation and oil substitution efforts are not successful.

Senior levels of government have developed a number of policies and programs concerning energy, in particular the National Energy Program and Ontario's 10-Point Program. While matters such as prices, energy supply, and development of alternative fuels are the concern of senior governments, RMOC can contribute to the energy conservation effort.

The Regional Official Plan has been amended to add a new major goal concerning Energy, namely "To develop the Region in a manner which uses energy efficiently and maximizes energy conservation wherever possible". Five specific goals were also added.

Implementation of the first specific goal - "to achieve energy efficiency in municipal operations" - was the subject of a separate report to Executive Committee.

The residential sector (particularly the space heating component) and the transportation sector offer the greatest opportunities for RMOC to directly influence energy consumption. Opportunities arise from RMOC's responsibilities for land use planning and for transportation.

Public transit is an energy efficient travel mode. In addition to implementing the measures to increase the attractiveness of transit to which Council is already committed (e.g. transitways, extension of the 560 information system), it is intended that existing residential and industrial subdivisions will be reviewed to identify deficiencies in collector road systems and pedestrian access to transit stops. Where serious deficiencies are identified, a detailed proposal to remedy them will be prepared and presented to Council. In the case of pedestrian access, this may involve a program for the creation of new all season walkways and sidewalks.

Biking, walking, and car- or van-pooling are other energy efficient travel modes. In 1980 Regional Council approved (subject to availability of funds) a proposed bikeway network for the urbanized area of Ottawa-Carleton, designed primarily for transportation-oriented bicycle travel. The search for funds to implement this program will continue. Regional Offcial Plan Amendment 34 requires area municipalities to include in secondary plans for new urban development some overall plan or policies to guide provision of pedestrian and bicycle facilities.

Sound transportation management practices in such areas as traffic signal control and road maintenance can save millions of litres of fuel (and millions of dollars).

The energy implications of land use planning policies concerning such items as the distribution of population and employment, infilling, and redevelopment near transit stations will be studied in the context of the Official Plan Review which is now underway.

Provision of a greater variety of services and facilities in residential areas may reduce auto travel needs. Regional Council encourages the area municipalities to study the impacts of less restrictive policies concerning the permissible land use mix, including home occupations, at the neighbourhood level.

Subdivision design affects energy use. Planning for efficient transit service and provision of pedestrian and bike routes will reduce transportation energy requirements. Guidelines for transit servicing are applied to both new residential and industrial subdivisions. Major concerns include provision of an appropriate collector road system and of all season pedestrian connections of a reasonable length

between building entrances and transit stops. These concerns also apply to large shopping developments. RMOC will pursue adequate transit servicing of large shopping developments by means of Transportation Department input to the site plan approval process for specific proposals.

Design which explicitly considers the local climate factors of wind and sun, as modified by topography and vegetation, can reduce space heating and cooling requirements for buildings. Any building with its longest axis oriented east-west will receive maximum solar radiation during winter and minimum solar radiation during summer. An uncomplicated way to increase the availability of sun to help heat homes in new subdivisions is to require the majority of streets run east-west (and lots north-south).

The policies concerning energy conservation which were applied to the East Urban Community in Amendment 17 to the Regional Official Plan have been amended to apply equally to all the new urban communities as well as major projects within the urban area. The policies are being implemented in the subdivision review and approval process. The text of Regional Official Plan Amendment 34 is in Annex B.

Additional measures could be implemented for greater assurance of solar access. Such measures include the use of shadow diagrams to test the provision of solar access in plans of subdivisions and implementation of solar zoning by-laws by area municipalities. Although existing plannning controls are sufficient to prevent shading by buildings, the prevention of shading by vegetation is more problematic. RMOC does not require solar access protection in new plans of subdivision at this time. Solar access protection in existing residential areas is left to the discretion of the area municipalities.

There are other areas related to Regional responsibilities which may provide future opportunities for energy conservation and fuel substitution.

Recycling is one such area, (RMOC is responsible for solid waste disposal.) The area municipalities, due to their responsibility for solid waste collection, have taken the lead role in promoting recycling in the community, particularly of newspaper. Recycling saves energy, reduces pollution and reinforces the conservation ethic.

RMOC, Energy, Mines and Resources, and the Ontario Ministry of Energy have entered into a two-year study to determine the feasibility of conversion of the region's wastes into steam and electricity.

District heating, the use of wood for energy, and the use of space resulting from underground mining are also potential areas for future energy conservation initiatives.

Further direct RMOC participation in many of these areas will be contingent on the results of feasibility studies and demonstration projects. At this time the Regional Official Plan has been amended to support recycling, waste heat recovery, and innovation relating to efficient energy use.

Outreach programs to encourage energy conservation in the community are another possible way for municipal governments to contribute to energy conservation. The City of Ottawa is already doing some work in this area. RMOC community outreach efforts consisted initially of promoting extensive circulation and public discussion of the draft version of this report. Based on the response to the draft report, a community outreach program was not recommended or approved.

3. BACKGROUND

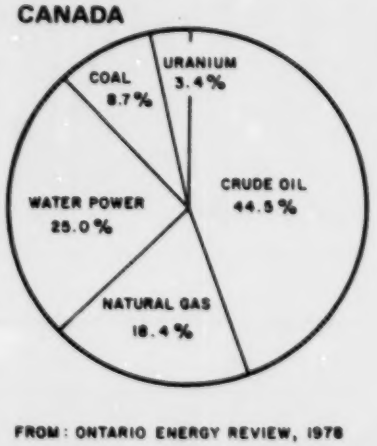
3.1 What is the energy problem?

3.1.1 National Perspective

From a national perspective the short term energy problem is one of the availability and price of crude oil. As illustrated in Figure 1 oil constitutes approximately 44% of Canada's primary energy consumption. Canada currently imports about 25% of the oil it consumes. This oil import requirement is a source of vulnerability, both from the point of view of cost and of security of supply. World supplies can be cut off or sharply curtailed for political or other reasons, as was dramatically illustrated by the recent Iran/Iraq war.

Fig. 1

Primary Energy Consumption (1978)

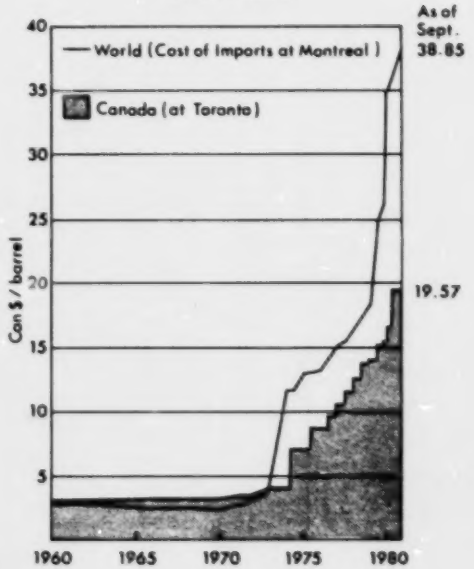


FROM: ONTARIO ENERGY REVIEW, 1978

The magnitude of the cost problem is illustrated in Figures 2 and 3.

Fig. 2

Crude Oil Prices: World, Canada 1960-1980



From: The National Energy Program 1980

The federal response is detailed in the National Energy Program (NEP). The central thrust of the NEP is a drive to reduce oil consumption through conservation and substitution of other fuels for oil. The goal is oil self-sufficiency by 1990. The NEP concentrates on reducing demand rather than increasing supply to solve the oil import problem as illustrated in Figure 4.

The magnitude of the conservation effort is demonstrated by a projected annual rate of growth in total primary energy demand of 1.9% over the period to 1990 (while maintaining an assumed average annual increase of 3.2% in economic growth). This can be contrasted with the historic rates of growth of primary energy consumption shown in Figure 5. Unless vigorous steps are taken, Canada's oil import requirements are estimated to be 40% of its consumption in 1990.

Figure 3

Assumed Annual Percentage Rates of Growth of Domestic Energy Prices, 1981-1987

	CPI Energy Prices Growth Rate (%)
1981	29.0
1982	18.7
1983	15.3
1984	13.1
1985	12.3
1986	11.9
1987	10.8

From: Department of Finance
Nov. 1981 Budget Document

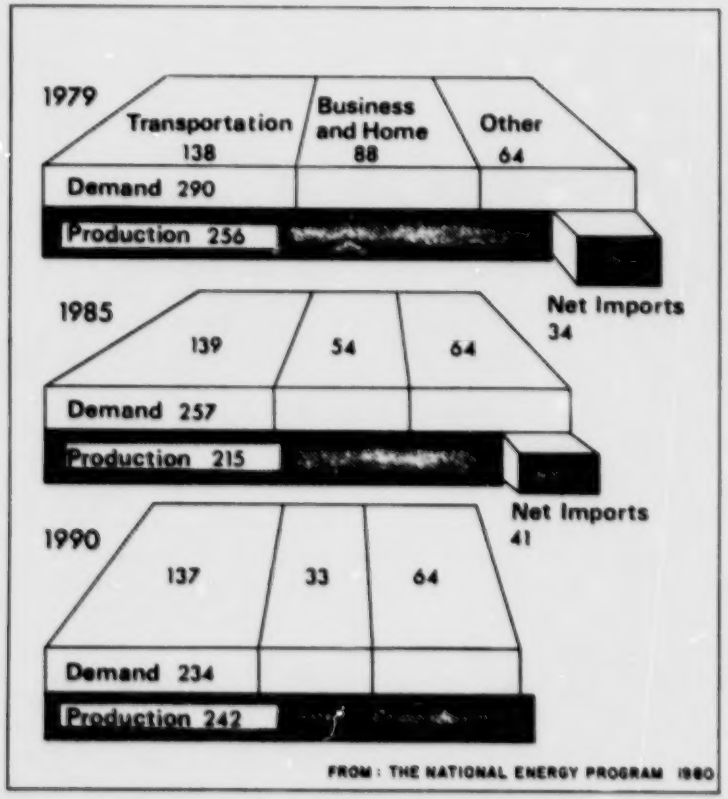
The various Federal energy conservation programs are summarized in Figure 6. The NEP also involves Federal actions in areas such as pricing, taxes, incentives for exploration and development of

energy resources, increased Canadian ownership of energy resources, measures to increase off-oil substitutions and research and development.

Fig. 4

Canadian Oil Supply and Demand

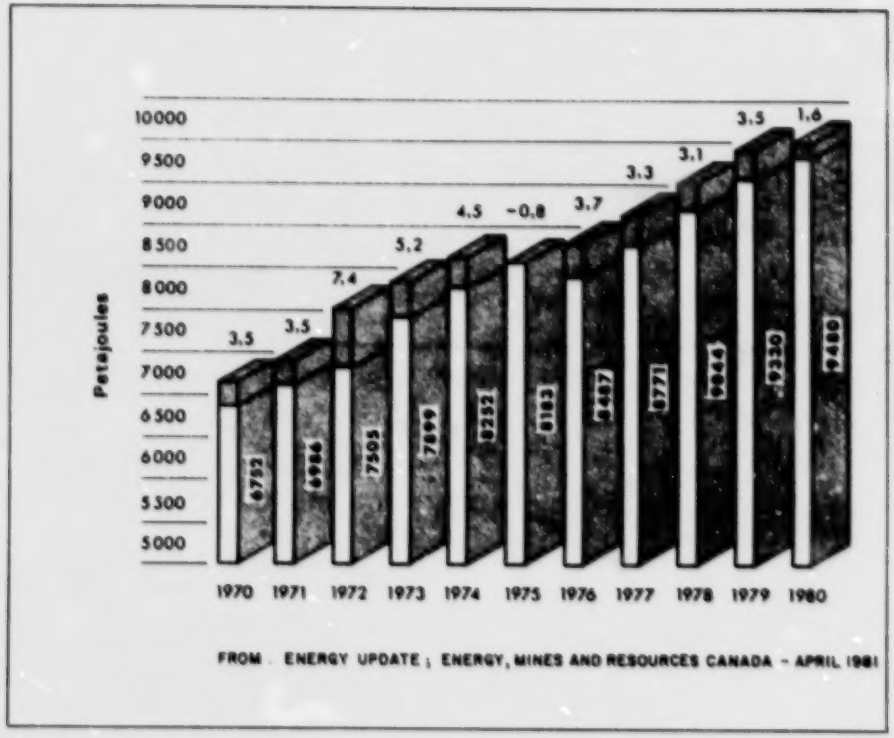
(Thousands of cubic metres per day)



FROM : THE NATIONAL ENERGY PROGRAM 1980

Fig. 5

Total Energy Consumption 1970 – 80



FROM : ENERGY UPDATE ; ENERGY, MINES AND RESOURCES CANADA - APRIL 1981

FIGURE 6 FEDERAL ENERGY CONSERVATION PROGRAMS

Commercial-Residential

THE CANADIAN HOME INSULATION PROGRAM (CHIP). Provides a taxable grant to improve the insulation of homes built before 1961.

THE CANADIAN OIL SUBSTITUTION PROGRAM (COSP). Provides taxable grants of up to $800 per dwelling unit to convert from oil heat to other fuels including renewables.

ENERGY EFFICIENT NEW HOUSING DEMONSTRATIONS. The Government has encouraged the design and construction of energy efficient new homes in various locations to demonstrate to builders and homeowners that energy efficient new housing is practical and economic.

ENER$AVE. A computerized home energy audit available free of charge recommends cost effective actions for reducing energy consumption.

OIL FURNACE RETROFIT PILOT PROJECT. Energy, Mines and Resources Canada has identified areas to upgrade oil burner performance, and produced a manual on these techniques for oil burner services.

REVIEW OF CODES AND STANDARDS. In co-operation with provincial governments, building energy codes and standards are being developed. "Measures for Energy Conservation in new Buildings" is one of the results of this activity.

Industry

An industrial conservation program is operated on a voluntary basis through 15 Industrial Energy Task Forces. Industry has achieved a 1980 goal to improve energy efficiency by 12% since the commencement of the program. The new goal is to increase the efficiency gain to 23% by 1985.

Transportation

Establish fuel consumption standards. The standards are 11.8 litres/100km (24mpg) for 1980 and 8.6litres/100km (33mpg) for 1985. This program is supplemented by fuel consumption labelling for new automobiles, several publications and a tax on air conditioners. Several provinces are involved in a federal-provincial demonstration to promote van pooling.

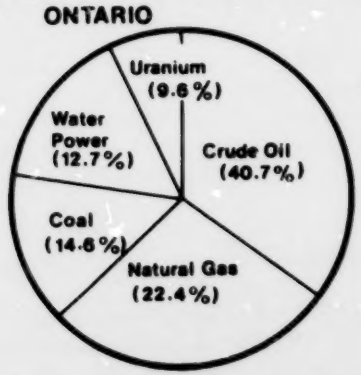
The Federal Government's Internal energy conservation program

The federal government reduced its own energy use in 1978-79 by 11.3% relative to energy use in the 1975-76 fiscal year. The cumulative monetary savings since the program was introduced exceed $100 million.

3.1.2 Provincial Perspective

Ontario's primary energy consumption in 1978 is shown in Figure 7. Of the various sources of primary energy, only water power and uranium, totalling 22.3 % of energy use are indigenous to the province. Since, from a provincial perspective, almost all oil is imported (from Western Canada), Ontario's policy for energy security places heavy emphasis on reduction of oil consumption through conservation and substitution. Specific energy security targets set by Ontario in 1980 include an increase in the supply of indigenous energy from about 25% in 1980 to at least 37.5% in 1995 and use of renewable and recoverable resources to supply at least 5% of Ontario's total primary energy by 1995.

Fig. 7
Primary Energy Consumption (1978)
ONTARIO



FROM : ONTARIO ENERGY REVIEW, 1978

The 10-point energy program to implement Ontario policy, as announced in October 1980, is summarized in Figure 8.

In addition to the 10-point program, the Ontario Ministry of Municipal Affairs and Housing has recently announced an energy planning program for municipalities, "Energy Conservation through Land Use Planning Grants". Under this program grants of up to 75% of eligible study costs will be provided to a maximum of $50,000 on energy-related planning studies. A study which may be eligible for funding under this program is identified later in this report.

Figure 8 ONTARIO 10-POINT ENERGY PROGRAM

The 10-point program emphasizes oil substitution and conservation, and includes:

- a $75-million, five year program to stimulate the development and marketing of alternative transportation fuels in Ontario;
- a $50-million, five year program to accelerate solar energy programs across the Province;
- a $12-million, three year conservation and off-oil conversion program for municipal government buildings, hospitals, schools and other public institutions;
- a $3.6-million, three year Municipal Energy Audit Program;
- a $10.6-million, five year extension of the Ontario Government's building energy conservation program;
- a $2.5-million program for converting Ontario Government buildings from oil to natural gas and other energy forms;
- a $10-million Industrial Conservation and Oil Substitution Program;
- revisions to the Ontario Building Code to incorporate energy conservation standards for commercial and industrial buildings;
- an expanded role for the Ontario Energy Corporation; and
- a skills development program for natural gas fitters and installers.

3.1.3 The Regional Perspective

The Region's Energy Profile

Community energy consumption profiles are primarily useful in the design and implementation of programs to reduce energy consumption in the entire community. The information is used to identify areas of greatest needs and opportunities for energy conservation. When collected on an ongoing basis, data can be used to monitor the impact of conservation measures on energy consumption.

No accurate energy consumption profile exists for Ottawa-Carleton. The Planning Department attempted to develop this profile in 1980. Unfortunately, some energy distributors were unable or unwilling to supply the required data. Experience in other municipalities indicates similar difficulties. Comprehensive data are not available from existing sources and can be very costly to obtain.

Although the regional energy profile could not be developed, a composite picture of municipal energy consumption in a "typical" municipality is presented in Section 4.1.

Regional Energy Supply

Almost all of the energy consumed in Ottawa-Carleton comes from outside the Region.

Oil is supplied to the Ottawa-Carleton region by a spur from the Trans-Northern pipeline, which runs between Toronto and Montreal. The pipeline can be fed from refineries at either end. The pipeline into Ottawa-Carleton terminates near Merivale Road where the major oil companies have storage facilities. There are no current problems with pipeline capacity. While forecasts for the Ottawa-Carleton area are not available, oil consumption in the provinces of Ontario and Quebec is expected to stabilize or decline due to conservation and conversion to other energy sources.

Natural gas is piped into the Ottawa area through a lateral of the Trans-Canada pipeline, which currently extends from Alberta to Montreal. Trans-Canada Pipeline has a proposal before the National Energy Board to build a new pipeline from North Bay through Ottawa-Carleton to connect with the existing pipeline near Morrisburg. The proposed pipeline will increase security of supply to meet higher demands for natural gas resulting from the federal grants for off-oil conversions and from the extension of natural gas pipelines east of Montreal to the Atlantic provinces.

Hydro is provided in some areas of Ottawa-Carleton directly by Ontario Hydro and elsewhere through the four local utilities: Nepean, Kanata, Gloucester, and Ottawa Hydro (which also supplies Vanier and Rockcliffe). Ottawa Hydro is the largest local utility with about 70% of all regional customers. It is the only local utility with any generating capacity. Modest hydraulic generating facilities on the Ottawa River supply about 2% of the current yearly peak power demand. All remaining power is purchased from Ontario Hydro (up until 1968, when contracts with the Gatineau Power Company terminated, substantial amounts of power were purchased from Quebec).

At present most of the electrical power supplying the Ottawa area is delivered by three 230 kV circuits (one from Chats Falls generating station on the Ottawa River and two from the R.H. Saunders generating station on the St. Lawrence River). The power generated on the Ottawa River is largely used to supply communities along the river such as Pembroke, Arnprior, Renfrew, etc. The power generated by the Saunders station near Cornwall is directed principally to the Ottawa area.

The need for additional power supply was identified as early as 1972 by Ottawa Hydro, but action was delayed by the Porter Commission and other factors. Ontario Hydro has excess generating capacity on a provincial basis, but new transmission facilities are necessary to bring the power to the Ottawa area.

A proposal by Ontario Hydro for new transmission facilities is currently in the early stages of the Environmental Assessment process. Allowing for Environmental Assessment and construction time, the earliest possible time by which new major facilities can be installed is 1988.

Meanwhile, Ontario Hydro has upgraded the local transmission system through various measures. These measures result in higher than normal operating costs and a reduced level of security. The situation will progressively deteriorate until new bulk transmission facilities are available.

Given the critical nature of this problem, it is imperative that electricity be used wisely. Homeowners desiring to reduce their heating oil consumption by converting to an electrical system, may wish to consider alternatives such as electric/oil hybrid heaters or electric heat pumps rather than direct conversion to electric furnaces which may place additional strain on the hydro situation. The heat pump is a true energy conserving device, whose energy output exceeds input by a factor of 2 to 3. Heat pumps are an economic proposition where central air conditioning as well as heating is required.

3.2 The regional response

3.2.1 Regional Implications of Energy Problem

The energy problem for the Region and its taxpayers is one of cost and security of supply. In addition to the concerns about oil identified by the senior levels of government, there is a short term problem of reduced security of supply for electricity until additional transmission facilities to increase bulk power supply to Eastern Ontario are in place.

The Regional government has neither the mandate nor the financial resources to directly affect the price or supply of energy or to do research and development. However it can contribute in an important way to the energy conservation effort.

As the federal government has stated, "conservation provides the cleanest, most enduring and, in many instances, the cheapest part of the solution to the oil problem of the 1980's and to an improvement in the basic energy balance".[1] Most current energy sources are non-renewable. Conservation of all forms of energy buys time to develop new sources of energy supply.

[1]The National Energy Program 1980 EMR, p.69.

Energy conservation is sometimes resisted because in the past increased energy consumption has been associated with economic growth. Data from the International Energy Agency reveal that Canada is the highest energy user among countries belonging to the Organization for Economic Co-operation and Development, when measured in terms of energy use per dollar of Gross Domestic Product (see Figure 9). The government of Canada has concluded that significant reductions in wasteful energy practices can be made without detriment to economic growth by, for example, re-insulating existing homes, improving heating systems, and legislating fuel efficiency standards for automobiles.

Fig. 9
Relative Energy Use - OECD Nations

Index: Western Europe = 100

	Output per unit of energy*	
	1973	1979
Canada	56	56
United States	61	62
Japan	101	107
France	122	125
Germany	110	110
Italy	91	99
United Kingdom	72	73
Western Europe***	100	100

* Gross Domestic Product in U.S.$ 1975 prices and exchange rates divided by total domestic energy requirements in tons of oil equivalent.

From: Royal Bank of Canada, Econoscope, July 1981.

3.2.2 Rationale for Regional Involvement

Energy conservation is an economic and political necessity for the entire nation. The decisions and actions of municipalities in areas such as housing and subdivision design, transportation networks and public transit affect energy use in both the public and private sectors.

As an example sound road maintenance and traffic operation practices can save millions of litres of fuel (and millions of dollars) for individuals and businesses in the community.

Energy conservation may also reinforce other regional goals such as control of all forms of environmental pollution and development of a publicly oriented transportation system.

All levels of government have an important role to play in providing public leadership. The federal and provincial governments have clearly established energy as a priority public issue. Municipal governments with their more direct relationship to the community must also do so. Visible energy conservation efforts by municipal government will help convince the public of the seriousness of the energy issue.

In fact municipal involvement has been steadily increasing. There are numerous examples of energy programs in other municipalities which can provide helpful information to Regional Council as it defines an appropriate Regional role in the area of energy management.

3.2.3 Regional Energy Goals

To provide a guide for regional action and a public statement of Council's commitment to energy conservation, the Regional Official Plan has been amended to add a new major goal to Table 1.1 Goals for the Region. This goal reads:

> "To develop the Region in a manner which uses energy efficiently and maximizes energy conservation wherever possible."

The specific goals included in the Plan are as follows:

- to achieve energy efficiency in municipal operations
- to develop energy conserving patterns of land use
- to maximize use of energy efficient modes of travel, such as public transit, walking and biking
- to promote recycling and waste heat recovery programs
- to encourage innovation relating to efficient energy use.

As mentioned previously, a separate report on energy efficiency in municipal operations was forwarded to Executive Committee. The report stated that a great deal is already being done by the operating departments (Works and Transportation) to conserve energy. A slightly more formalized arrangement to increase co-ordination and communication and utilization of several provincial grant programs were recommended to further increase the visibility and effectiveness of efforts to conserve energy in RMOC's internal operations.

RMOC has now created and filled the position of Energy Auditor/ Coordinator. Energy conservation in internal operations is the usual starting point for municipal involvement in energy conservation.

More explicit information on what can be done to implement the other specific goals is presented in the remainder of this report.

4. CONSERVATION

TRANSPORTATION AND PLANNING

4.1 Opportunities for energy conservation

A picture of energy consumption in a "typical" municipality is presented in Figure 10. The following discussion presents a sector by sector analysis of energy conservation opportunities with specific reference to those opportunities available to regional government.

Residential - Approximately 75% of the energy used in this sector is for space heating. The greatest opportunities for energy conservation lie in increasing the energy efficiency of the existing housing stock (through insulation, weatherstripping, caulking and improvements to heating systems). Potential savings are greatest because the existing stock is estimated to constitute between 61% and 72% of the total units in Ottawa-Carleton in 2001, and because much of existing stock is currently so inefficient. It has been estimated that a moderate program of retrofitting the existing housing stock in Canada could save 35% of the average heating load per year (with a cost payback of six to seven years).[1]

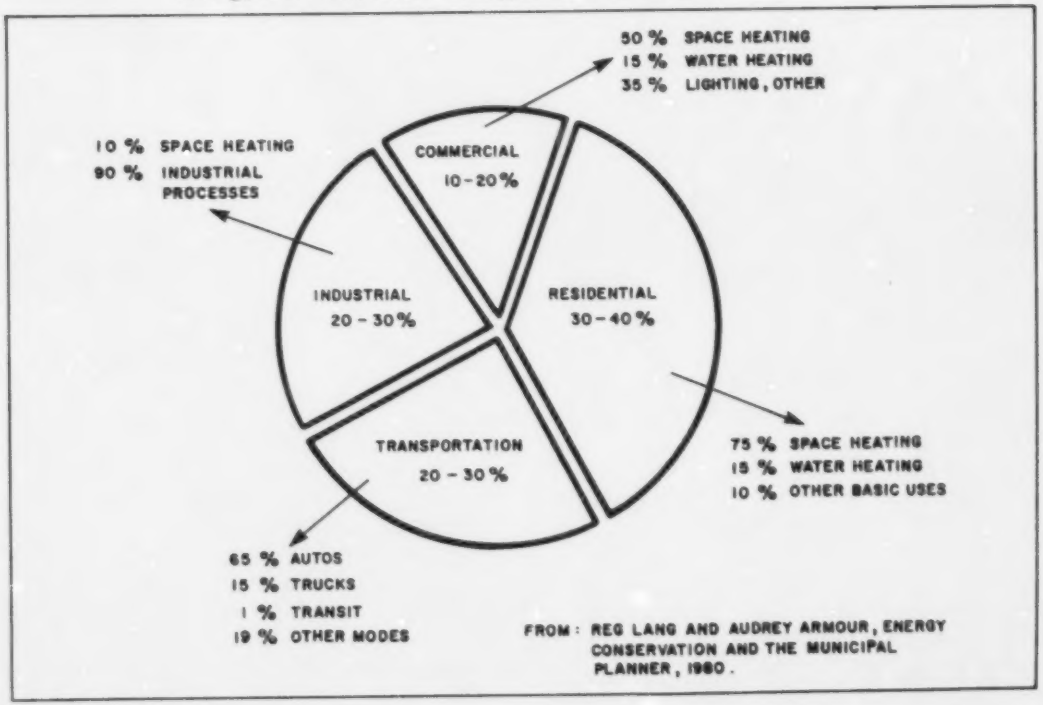
[1]David B. Brooks, Economic Impact of Low Energy Growth in Canada: An Initial Analysis (Ottawa Economic Council of Canada, Dec. 1978), p.119.

The federal government provides financial incentives to improve energy efficiency through the Canada Home Insulation Program (CHIP) and the Canada Oil Substitution Program (COSP). Advice is available through programs such as ENERSAVE (federal) and HEATSAVE (Ontario). Municipalities can help co-ordinate retrofit programs and promote participation through community outreach programs.

Another major opportunity for energy conservation in the residential sector is improved energy efficiency for new housing units. (In RMOC it is anticipated that between 77,000 and 127,000 new units will be built by 2001).

Planning controls may be used to influence the type, location and orientation of buildings to minimize heat loss and maximize potential solar gain. (For more details, see section 4.4.2).

Fig. 10
Energy Consumption in a "Typical" Municipality



Building code standards should require that new housing units be more energy efficient. The existing Ontario Building Code sets minimum standards for insulation in residential buildings of three storeys or less with an area not exceeding 6000 square feet. The Province has promised to update these energy efficiency standards. The senior governments also conduct research into more energy-efficient materials (e.g. insulation) and systems (e.g. furnaces).

A final important determinant of energy consumption in the residential sector is the behavior of the residents. All levels of government can publicize and promote conserver behavior patterns.

Commercial - Public institutions are included in the commercial sector. Energy use in this sector is divided between space heating (50%), water heating (15%) and lighting and other uses (35%).

The main opportunities lie in making commercial and institutional buildings more energy efficient and adjusting their operation.[1] In existing buildings this usually means retrofit programs.

Opportunities to conserve space heating energy in this sector are similar to those discussed for the residential sector.

The present insulation standards of the Ontario Building Code do not apply to non-residential buildings. Revisions to the Ontario Building Code to incorporate energy conservation standards for commercial and industrial buildings are part of Ontario's 10-Point Energy Program.

As an example of an initiative undertaken by a municipal government, the City of Ottawa is encouraging an Energy Use Statement for new industrial, commercial, and residential buildings with 25 or more units. The information will build an important data base, but the City cannot approve or reject projects based on their energy requirements.

The Ontario Ministry of Energy launched a Downtown Energy Conservation Program in Ottawa in February 1981. This is a voluntary program for owners and managers of downtown buildings, including offices, hotels and apartments. Participants are encouraged to set savings targets and delegate responsibility for energy conservation to an energy co-ordinator in each organization. The Ministry of Energy and local utilities act as support groups, providing technical advice as required. Achievements of participants are to be reported annually at a Downtown Energy Forum.

Industrial - In this sector approximately 90% of the energy used is for industrial processes. (This applies generally; it may not apply to the industrial structure of Ottawa-Carleton. If in fact space heating is a significant energy use for RMOC industries, the comments related to space heating in the commercial sector apply.)

Substantial opportunities do exist for increased energy efficiency in industrial processes, especially through improved process heat and steam usage, co-generation, and recycling of waste materials. These are best addressed by the industries themselves, often with advice and incentives from senior governments.

Transportation - Nationally, energy consumption by mode is estimated to be approximately 59% for autos (nearly two-thirds of it in urban areas) trucks 13%, air 13%, rail and marine 7% each, and urban transit 1%. Within urban areas, the picture is somewhat different with the auto more dominant accounting for between 60-[illegible]% of all energy use. In terms of trips, the journey to work dominates with recreational/social and shopping trips following.

[1] Reg Lang and Audrey Armour, Energy Conservation and the Municipal Planner (Ottawa, EMR, February 1980), p.54.

Opportunities to conserve energy in this sector reflect its virtual dependence on oil and the dominance of the automobile. Many measures to reduce this dependence are the responsibility of the senior levels of government - e.g. development of alternative transportation fuels, mandatory energy efficiency performance standards for the automobile, taxing and pricing policy.

There are however significant opportunities for the Region to influence energy consumption in the transportation sector. The opportunities arise because RMOC designs and maintains the basic road network, provides bike and pedestrian facilities, operates the transit system, and has more influence than any other level of government over the interaction of land use patterns and the transportation system through its planning powers.

Conclusion

The residential sector (particularly the space heating component) and the transportation sector offer the greatest opportunities for direct Regional influence on energy consumption. In the residential sector the key consideration is the control of building orientation to maximize the potential for capturing solar energy. Within the transportation sector opportunities arise both from policies which directly impact the transportation network and from land use planning policies which interact with the network to influence the choice of travel mode and trip length.

4.2 Transportation measures

4.2.1 Public Transit

Much has been done in the Region to encourage the use of transit (by OC Transpo and others). These efforts have been successful. OC Transpo has one of the highest ridership (174 projected rides per capita of the service area population in 1983) of any transit system in North America.

Some of the measures already implemented include:

- introduction by the Federal Government of flexible working hours in 1974 and of employee parking charges in 1975;
- exclusive bus malls and bus lanes on some streets;
- bus passes;
- provision of more bus shelters and route map displays;
- provision of dial-a-bus (Tele Transpo) service in some areas; and
- the 560 computerized bus information system.

"Using the current average vehicle occupancies and fuel consumption rates, it is estimated that the 39 million annual passengers added since 1971 reduced automobile fuel consumption in 1980 by 50 million litres while only adding 15 million litres to the diesel fuel consumption of OC Transpo."[1]

Future measures to increase the attractiveness of transit include construction of a system of exclusive bus ways (transitways), expansion of the "560" information system, greater use of the timed transfer concept and transit terminals. The transitways when completed will provide rapid express service to the downtown core from the south, southwest and eastern portions of the region. Buses operating on the transitways are anticipated to achieve an approximate 35% improvement in fuel efficiency due to fewer stops and higher average operating speeds [from 1.9 kilometres per litre (km/l) non-transitway to 2.6 km/l transitway for a standard bus and from 1.3 to 1.8 km/l for an articulated bus.][2]

To complement these measures, it is intended that existing residential and industrial subdivisions will be

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[1] "Better Information Equals More Riders", John A. Bonsall and Mary Whelan, (June 1981, p.16).

[2] Ottawa-Carleton Rapid Transit Development Programme, Technical Memorandum Task 5042, April 1980 (amended), p.7.

reviewed to identify deficiencies in collector road systems and pedestrian access to transit stops. Where serious access deficiencies are identified, a detailed proposal to remedy them will be prepared and presented to Council. In the case of pedestrian access, this may involve a program for the creation of new all season walkways and sidewalks. The Transit Planning Branch will take the lead role in these reviews, with co-operation from OC Transpo and the Planning Department, and community consultation as required. By making access to the public transit system more convenient, such a program could produce major benefits in terms of increasing OC Transpo's ridership levels and operating efficiency.

4.2.2 Alternative Energy-efficient Travel Modes

Biking, walking and car- or vanpooling are all more energy efficient modes of travel than use of the private automobile.

In 1980 Regional Council approved (subject to availability of funds) a proposed bikeway network for the urbanized area of Ottawa-Carleton, designed primarily for transportation-oriented bicycle travel.

The $3.7 million 5 year bikeway implementation program will add approximately 310 km of bikeways to the existing 75 km and provide a continuous service from Kanata in the west to Orleans in the east. This proposal has a significant potential for energy conservation by increasing the use of bicycles for trips between major activity centres.

Due to financial constraints funds have not been included in recent budgets for the implementation of this program.

Recreational portions of the bikeway system may be eligible for Wintario grants but matching funds from the municipality would be required. Recreation links are the least important from an energy perspective. The search for funds to implement the bikeway program will continue.

Regional Official Plan Amendment 34 (see point 6) requires that detailed planning for new urban development must include some overall plan or policies to guide provision of pedestrian and bicycle facilities. Such policies will facilitate the provision of appropriate links for bikeways in individual plans of subdivision.

Ridesharing (car- or vanpooling) is an energy-efficient alternative travel mode for trips which begin and/or end in areas not served by urban transit. Vanpools typically operate on a fixed schedule and involve payment of a fare. Due to RMOC's exclusive franchise with respect to passenger transport service, it would be necessary for vanpools to be approved. The Legal Department will prepare the necessary agreement. Informal carpooling arrangements are not affected by this requirement.

The Ottawa-Carleton Transportation Department has already conducted a preliminary feasibility study of The Market for Ridesharing in Ottawa-Carleton, under the sponsorship of the Ontario Ministry of Transportation and Communications. The study confirmed the feasibility of ridesharing in areas not served by transit.

4.2.3 Transportation Management

Most measures which improve traffic performance also reduce energy consumption. For instance, the selection of intersection controls affects energy use. As an example, the two four-way stops installed on Alta Vista Drive at Cunningham and at Billings will cause the use of an extra $400,000 worth of fuel per year by 1986. It is estimated that 60-70% of the four-way stops in larger urban centres are unwarranted. The Region of Durham found approximately 700 unwarranted stop

signs during a complete examination of their intersection controls.[1]

Another factor to consider is road surface maintenance. The latest research by the World Bank indicates that vehicle fuel use increases dramatically as road surfaces deteriorate in quality. One kilometre of roadway with 10,000 vehicles per day with a very poor surface can cause the waste of $90,000 per year, with fuel waste accounting for 70-75% of this amount. With 1,000 kilometres of system and volumes in excess of 35,000 vehicles per day on parts of this system, Ottawa-Carleton road maintenance has a massive effect on fuel use, potentially in the tens of millions of dollars.

Because of this interrelationship between traffic measures and energy conservation, it is not surprising that the Transportation Department reports that it "has pursued and continues to employ extensively such measures. The basic objective of these measures is to provide good transportation service in terms of pavement condition, travel speed, reduced congestion and delay, etc.

The Transportation Department has a comprehensive traffic management philosophy which applies various measures to different scales of traffic issues. These measures range from Region-wide system improvement through localized measures to spot treatments. The combined effect of these measures in Ottawa-Carleton saves millions of litres of gasoline a year."

Some examples of these measures include:

Region-wide

- Comprehensive central computer controlled traffic signal system and its retiming.
- Major one-way street systems.

Localized

- Frequent updating of traffic signal system timings to reflect current traffic conditions.
- Reversible lanes.
- Parking and stopping restrictions.

Spot

- Intersection modifications.
- Specialized complex traffic signal systems.
- Introduction/removal/modification of traffic movement priorities.
- Ramp metering.

However, traffic flow facilitation measures may encourage car usage and consequently increase energy consumption. As pointed out in a provincial publication:

Traffic management measures, when implemented in isolation, can actually waste energy. Changes that make driving easier and more pleasant - as these measures do - increase the attractiveness of the car relative to such energy-efficient alternatives as public transit or ride-sharing. Consequently, traffic management can result in more people driving more cars (and thus using more energy) than would otherwise have been the case. A comprehensive management approach will avoid this problem by also implementing such measures as exclusive bus lanes, pedestrian and cycling facilities, parking restrictions and pricing policies to encourage the shift to more energy-efficient modes of transportation.[2]

It is Regional Council policy to favour transit improvements over new road construction. Consideration of transportation management options must include the relative impact on auto and transit usage.

The Region already belongs to the Municipal Transportation Energy Advisory Committee (MTEAC), a joint

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[1] MTEAC, Municipal Transportation Energy Seminars: Summary of Proceedings May 1981, p.77

[2] Ontario Ministry of Transportation and Communications, Transportation Energy Management Program, Energy Conservation through Traffic Management, August 1981, p.5.

committee of municipalities, operating agencies and provincial ministries. The Committee has two principal goals; to reduce consumption of petroleum fuels within municipalities through more efficient use of the total transportation system, and to encourage lifestyle and travel patterns which result in less demand for transportation energy. The Committee provides a forum for guidance, technical assistance and coordination.[1]

4.3 Land use planning measures

Land use planning policies indirectly impact transportation energy requirements and directly impact energy requirements for the space heating and cooling of buildings.

4.3.1 Urban Form

The distribution of land uses influences energy consumption. In general compact cities are more energy efficient because of shorter transportation and servicing networks.

The basic elements of the Region's settlement pattern are already established (i.e. new development will be directed principally to existing urban areas and several new urban communities).

Energy conservation was not an explicit objective when the present Regional Official Plan was written. However, the concerns about security of energy supply and rapidly increasing cost have so intensified in recent years, that Amendment 34 made energy a major goal within the Plan. The specific goal with regard to urban form is "to develop energy conserving patterns of land use".

This specific goal is incorporated as part of the general review of the Plan which is now taking place. Related to this new energy goal, the plan review process is looking at several matters:

- review of dispersed versus concentrated economic activity, e.g. Is the 100,000 job limit for the CBD still relevant?;
- review of the district centre concept and their relationship to the rapid transit routes;
- review of the need for expanded or additional urban communities within the context of other possible population distributions, such as concentration of more development within the greenbelt.

4.3.2 Density

Higher densities generally result in energy savings.

Increased densities in terms of units per hectare (regardless of building form) generally reduce per capita transportation and servicing costs.

Infilling (residential development of small parcels of vacant or underutilized land in urban areas) is an obvious way to increase densities. The Regional Official Plan could include policies to encourage infilling.

In conjunction with the Official Plan Review, the Planning Department is studying the potential for infilling development, primarily within the City of Ottawa. Vacant parcels are identified and the existing zoning is used to estimate unit potential. The same study is also examining the possibilities for creation of additional units through the conversion of large single family homes where this is permitted by the zoning by-law.

Similarly, during the Official Plan Review, attempts will be made to estimate the energy benefits between different land use patterns and from increased densities of both population and employment.

Increased densities in terms of attached building forms signifi-

[1] MTEAC in turn is one of many components of the Transportation Energy Management Program (T.E.M.P.), established in 1979 to reduce Ontario's transportation dependence on oil.

cantly reduce space heating requirements. A row house (interior unit) consumes 40% less energy for space heating than a comparable detached house. Energy savings increase with the number of attached walls. (See Figure 11.)

Official plans and secondary plans typically contain policies on the desired mix of housing types. Plans and implementing zoning by-laws can effectively prevent construction of certain housing types, but cannot ensure construction of desired housing types. The only way for a municipality to ensure construction of a desired housing type is to act directly through a municipal non-profit housing corporation.

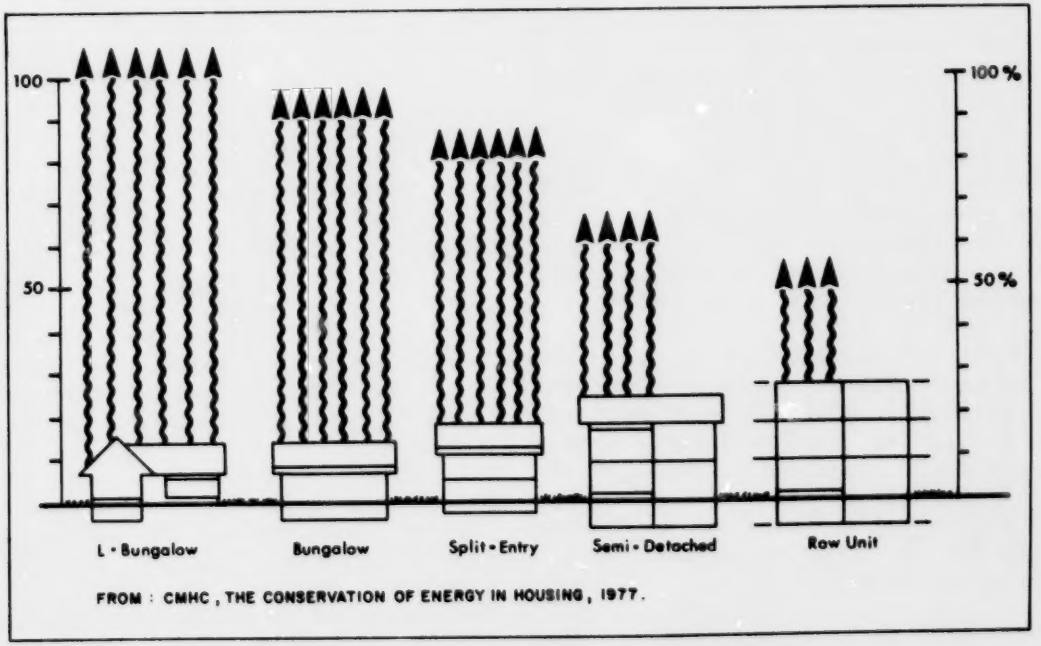
At present the Regional Official Plan contains policies intended to obtain an adequate supply of ground orientated units to accommodate families. As the Plan now stands, a minimum of 55% of new units on vacant land in urban areas are to be ground orientated and a minimum of 50% of these ground orientated units are to be detached or semi-detached units. The policy does not contain any maxima. It reflects the situation in the early 1970's, when many high-rise apartments and few low density units were built. The situation is now reversed. Council has approved a number of applications to resubdivide and down zone land formerly intended for higher density development. The entire policy is being reconsidered during the Official Plan Review.

While in some areas planning policies may be restraining higher density residential development, the chief restraints at present are economic ones, including rent controls and high interest rates. In the present depressed housing market, most residential development proposals are for low density housing types. Economic incentives from senior levels of government may be necessary to obtain construction of medium and high density housing types.

Market demand for attached housing types might be increased if consumers were more aware of the energy requirements of various housing types. A committee of the Canadian Standards Association is studying available energy consumption standards in order to develop a means to evaluate the overall amount of energy homes consume. The ultimate result could be the labelling of housing for energy consumption, similar to the ENERGUIDE labelling of appliances.

Fig. 11

Relative Heat Loss for Houses of Various Types and Design



4.3.3. Mixed Uses

Another factor, related to urban structure, is the arrangement or mix of land uses. The general view is that land use mixing and integration is more energy efficient than segregation. This view is largely theoretical; there are few empirical studies of documented energy savings. Discussions of land use mix and energy relate to two distinct levels.

At the Regional level, mixed uses could mean permitting employment opportunities (industrial and commercial) close to or in certain circumstances within residential areas. Energy savings would arise from shorter work and shopping trips and perhaps increased potential for use of waste heat from industrial processes and for co-generation. Present Regional Official Plan policy permits major non-residential uses in areas designated "Residential District" only if they act as buffers along major transportation routes.

Or mixed uses could mean the creation of higher density mixed use areas. Current Regional Official Plan policy provides for "district centres", which are concentrations of hotels, offices, shopping centres and apartments. An example is the designation at Carling and the Queensway.

At the local level, mixed uses could mean ensuring that a range of neighbourhood facilities and home occupations are permitted in urban residential areas. This is controlled by the area municipalities through more detailed local official plan policies and zoning by-laws. Neighbourhoods will differ in the variety of facilities and services which are desired and economically viable.

Currently the home occupation provisions of most zoning by-laws are quite restrictive. Essentially they permit only those occupations which are totally indiscernible. The City of Ottawa recently adopted a more permissive home occupations by-law. The City of Ottawa is also proposing a study of Energy Use and Land Use Patterns in the City, which may help to formulate patterns of mixed land use, offering the potential of energy saving multi-purpose types.

Regional Council encourages the area municipalities to study the impacts of less restrictive policies concerning the permissible land use mix, including home occupations, at the neighbourhood level.

The impacts of changes in land use mix at the Regional level require further study before an amendment to the Regional Official Plan is proposed. Much of this work, such as review of the district centre concept or testing of the transportation implications of alternative employment distributions, is being done as part of the review of the Regional Official Plan.

4.4 Subdivision Design

The approval of plans of subdivision offers significant opportunities to influence energy conservation. This section of the report directly addresses the issue of what desirable energy saving features can be incorporated in plans of subdivision, as requested by Council. It is not a comprehensive treatment of all energy-related aspects of residential site design. Other energy conservation measures related to house design and lot landscaping as well as behaviour patterns are not discussed because they are matters of individual rather than government control.

The discussion focusses on energy-related elements of subdivision design which may be influenced by municipalities primarily through the exercise of planning controls. Although the chief emphasis in this report is on what the Region can do through its Official Plan and its delegated subdivision approval powers, the area municipal role is also presented. Zoning by-laws, site plan controls and subdivision agreements are planning tools with great potential for ensuring energy-conserving forms of new development.

The discussion is written with reference to plans of subdivision. However where secondary plans and local official plan amendments are proposed to permit urban development, the same energy saving considerations should be incorporated. Failure to address this issue at the official plan stage may constrain the opportunity to design energy conserving plans of subdivision at a subsequent stage of plan implementation.

4.4.1 Transportation within Subdivisions

Subdivision design impacts energy requirements for transportation.

Transit

The first energy conserving measure is careful provision for attractive and efficient transit. If transit routes are identified early in the subdivision design process and the arrangement of land uses around these routes carefully considered, the transit route can be designed for economical operation and potential transit ridership can be maximized. This kind of early co-ordination with transit planning is already done in Ottawa-Carleton.

The guidelines used by the Transportation Planning Division are explained in a report titled "Transit Servicing of New Urban Areas-Guidelines for Development", attached as Annex C. The most important consideration is provision of an appropriate collector road system. The standards for walking distance from all buildings to transit stops are a maximum of 400 metres (¼ mile) and a desirable standard of 300 metres.

Other conditions relate to the provision of sidewalks, paved walkways through open areas and paved passenger standing areas at potential bus stop locations. The distribution of land uses is considered. For example, overall walking distances are minimized by placing all high-density developments on streets serviced by transit.

The guidelines are applicable to both new residential and industrial subdivisions. RMOC can impose requirements as conditions of subdivision approval.

These concerns about transit servicing are equally applicable to large shopping developments. RMOC will pursue adequate transit servicing of large shopping developments by means of Transportation Department input to the site plan approval process for specific proposals. As site plan approval is primarily a planning power of local municipalities, area municipal co-operation is crucial to obtaining Regional requirements. In the past adequate transit servicing has not always resulted.

Alternative Travel Modes

A second measure for promoting energy conservation is the provision of pedestrian routes and bikeways. Area municipal support of this strategy is essential for its success.

Local official plan amendments and secondary plans for urban areas can indicate a basic network of bikeways and walkways. The result will be a continuous system which provides safe and convenient links between important destinations, an essential prerequisite if biking or walking are to be realistic transportation alternatives as well as forms of recreation. Area municipal support is also required because maintenance of bikepaths and walkways is usually their financial responsibility.

Land Use Mix

A third way to affect transportation energy requirements is to examine the mix and arrangement of land uses for opportunities to reduce trip lengths. The provision of a greater variety of goods and services within residential areas has already been discussed in Section 4.3.3.

The arrangement of land uses affects transportation energy requirements. The clustering of commercial and community uses facilitates multi-purpose trips.

If high density dwellings are located near arterial exits, travelling distances are reduced for the maximum number of people.

4.4.2 Climate Sensitive Subdivision Design

The space heating and cooling requirements of a subdivision are strongly influenced by the type and mix of housing units (built form) discussed in Section 4.3.2 and by the location and orientation of units with respect to the local climate factors of wind and sun, as modified by topography and vegetation.

4.4.2.1 Factors

Building Orientation

The sun's path varies with the season. In winter it rises in the southeast, stays relatively low in the south sky and sets in the southwest. In summer it rises in the east, goes much higher overhead, and sets in the west. For this reason in Canadian latitudes, the south facade of a house receives twice as much solar radiation in winter as in summer. East and west facades, in contrast, receive 2½ times more solar radiation in summer than in winter.[1] Any house with its longest axis oriented east-west will gain the minimum amount of heat during summer and receive the maximum of solar radiation during winter.[2] Proper orientation results in lower heating and cooling loads for the life of the structure.

The sensitive placement of windows (maximize south, minimize north and west windows) will further enhance the benefits of proper building orientation. "Proper orientation of buildings toward the sun, combined with the right placement and design of windows, can save 15 to 20 percent of the energy needed in heating at no extra cost."[3] This level of savings is possible without any special passive or active solar features, but the building orientation will also facilitate the installation of solar energy systems if and when desired.

The optimum building orientation just discussed only applies if there is solar access to the south wall of the building. The possibilities for south wall solar access are maximized if streets are oriented east-west and lots are oriented north-south.

Topography

The slope of a site affects both the intensity of solar radiation and the length of shadows. The closer to perpendicular the sun's rays are to a given site, the greater the intensity of sunlight on that site. At Canadian latitudes south facing slopes are more nearly perpendicular to the sun's rays than slopes facing other directions or than level ground. The shorter shadows on a south facing slope make possible a closer spacing of buildings without shading problems.

On north facing slopes, the situation is reversed and shadows are longer. The spacing between buildings which results from current development patterns is often insufficient to avoid shading on north slopes. However shading problems are less likely for commercial, industrial, and institutional uses, due to the associated parking areas. Where

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[1] The Solar Home Book, Bruce Anderson with Michael Riordan, Brick House Publishing Co., Inc. (Harrisville, New Hampshire), 1976. p.80.

[2] In this report unless explicitly stated otherwise, a building's orientation is defined as the direction of a building along its longest dimension. In some reports, building orientation is defined in terms of the wall with the largest window area or the wall with the living room window (they often coincide). This definition results in recommendations that a building should be oriented south.

[3] "Planning Energy-efficient Communities", Bill MacKay, Ontario Housing. January-February 1981. p.15.

possible, it is preferable to locate these non-residential uses or open space rather than residential uses on north slopes. In some instances judicious location of open space may increase the spacing between buildings and enable solar access on north slopes.

Cold air flows downhill unless impeded and can collect in depressions on a particular site. Placement of buildings in such cold air sinks should be avoided. To minimize the extent of this effect, the road system may be used to create an outlet to drain cold air away from the sink.

Wind

Transmission heat losses (through walls, roof and particularly windows) and infiltration heat losses (through openings and cracks in the building structure) are both directly related to wind speed. Such heat losses can thus be reduced by minimizing windows on building surfaces facing winter winds and by sheltering buildings from wind (either by deflecting wind or reducing wind speeds).

The prevailing winter wind direction will vary with specific sites and should be checked on a site by site basis.

The optimum orientation of a building with respect to sun may not always be optimum with respect to wind effect. A recent study sponsored by the Ontario Ministry of Municipal Affairs and Housing concluded that it was more rational to determine building orientation by solar radiation and achieve shelter from wind by way of landscaping and other buildings. It is possible to locate vegetation, berms and fences so that they lower heat losses due to wind without unduly interfering with the path of radiation during the heating season. One source indicates potential energy savings of 10 to 20% due to landscaping protection from wind.[1]

Opportunities in subdivision design to reduce the impact of winter winds should be recognized and exploited. An existing woodlot might be retained, or an earth berm may serve the dual purpose of noise barrier and wind shelter.

Vegetation

Vegetation has a strong impact on local micro-climate. When properly chosen and located it can moderate both summer and winter extremes, for example by channeling summer breezes and deflecting winter winds.

Deciduous trees are recommended to provide summer shade to the south and east surfaces of buildings where winter sun penetration is desirable.

The choice of deciduous species should consider the shape of the crown, the bare twig density and the timing of the leaf season. Short wide trees give maximum beneficial summer shade, while minimizing detrimental winter shade (as shown in Figure 12).

Evergreen trees, preferably in staggered rows two or three deep, are recommended as winter windbreaks to the north and northwest of buildings.

Municipalities with street tree planting programs may wish to consider impacts on solar access and wind as factors in the choice of tree species and location of tree plantings. The same factors should be considered in the landscaping and development of parks and other public open space.

4.4.2.2. Planning Controls and Climate Sensitive Design

The Region's delegated subdivision approval powers can be used to obtain proper street and lot orientation, as well as an arrangement of uses which facilitates solar access by such means as careful placement of open space and siting

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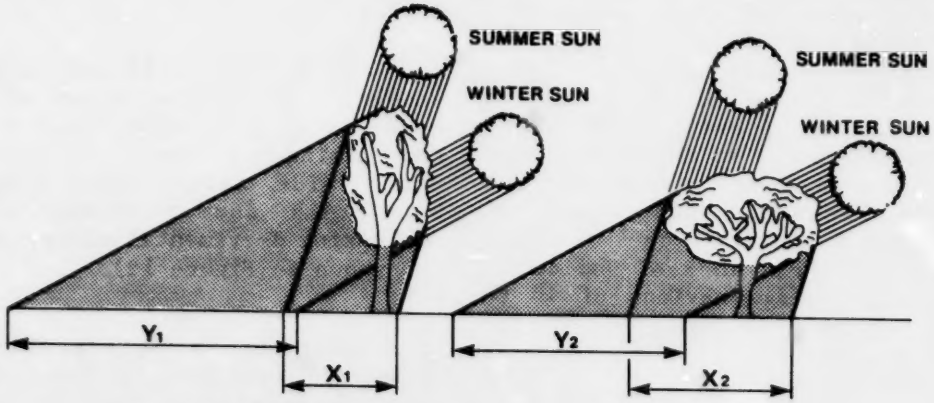
[1] Energy and the Community: Vol. 2 Shaping the Community, Nov. 1979, Planning and Development Department, Regional Municipality of Niagara. p.28.

Fig. 12
Deciduous Tree Form and Solar Access



blocks of land for high density development north of land designated for low density development.

Streets oriented east-west will maximize solar access. Units on east-west streets are separated from their nearest neighbour to the south by either two front yards and a street or two back yards, while units on north-south streets are separated by only narrow side yards from their southern neighbours. Shading on east-west versus north-south streets is illustrated in Figure 13.

Flexibility in the orientation of streets is desirable, so that the street pattern can be responsive to matters such as storm drainage patterns as well as solar access.

Flexibility in street orientation is possible because a building can be shifted significantly away from an east-west orientation without a great loss in the amount of available solar radiation to the south wall and roof. However, this shift in orientation will increase the problems of summer overheating.

Building axes should be within 25 degrees either side of the ideal east-west orientation. Streets may then also vary to the same degree. RMOC cannot directly control the orientation of buildings but it can control the orientation of streets.

Greater variation in street orientation is possible if lot lines are permitted to be laid out at oblique angles to the street (rather than perpendicular).

Lots should be oriented within 25 degrees of a true north-south axis. If skewed lots are used to achieve this, care must be taken to ensure that houses are not shaded by their neighbours. An angle of at least 45 degrees between a north-south line and the line drawn between neighbouring south corners of adjacent houses will ensure reasonable solar access. This relationship is illustrated in Figure 14.

Scrutiny of the arrangement of land uses is an established part of the subdivision approval process. Energy conservation impacts become an additional factor to be weighed during the review process.

Fig. 13
Shadows on Dec. 21 for R-2 zone at 10 a.m.

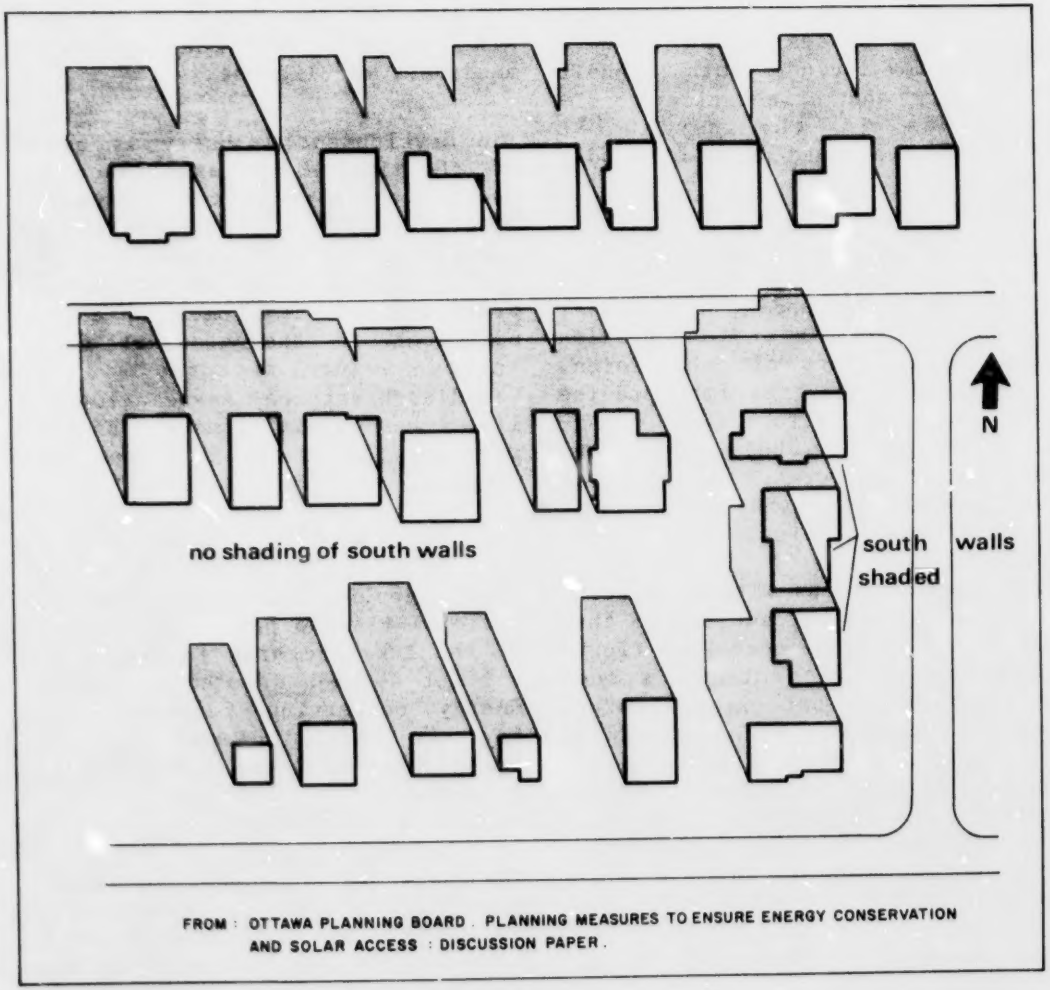
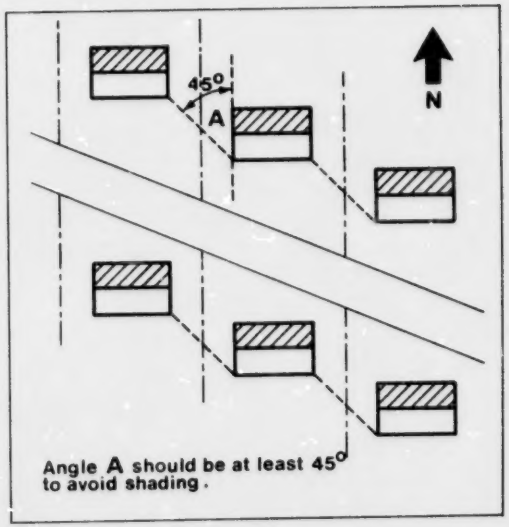

N
no shading of south walls
south walls
shaded
FROM : OTTAWA PLANNING BOARD . PLANNING MEASURES TO ENSURE ENERGY CONSERVATION AND SOLAR ACCESS : DISCUSSION PAPER .

Fig. 14
House Placement on Skewed lot



4.4.2.3 Implementation

The Regional Official Plan has been amended to include policies on energy conservation measures which will be required in new plans of subdivision and secondary plans for urban areas.

Official Plan Policies

When dealing with the concept plan for the East Urban Community, Regional Council included in Amendment 17 to the Regional Official Plan the following policy:

"Specifically with regard to the East Urban Community Council is

concerned that the community be developed in such a way as to encourage the use of transit by locating transit service in proximity to residential units, and commercial, industrial and institutional uses. Furthermore energy savings should be encouraged by developing plans of subdivision with lots having a southern orientation and minimizing travel needs."

The policy was subsequently elaborated as follows:

"(6) In the East Urban Community all secondary plans and subdivision plans shall be designed to provide for the efficient delivery of transit service to within ¼ mile (400 m) of virtually all residential units and within ¼ mile of all commercial, industrial and institutional uses.

(7) In the East Urban Community subdivision plans shall be developed with a view to minimizing energy requirements by providing good opportunity for developing south facing buildings, minimizing auto travel needs and such other provisions as may be warranted."

These policies have been amended to apply equally to all the new urban communities as well as major projects inside the greenbelt and to make them more explicit. The amendment provides staff with a mandate to include both transit efficiency and orientation considerations in the review of secondary plans and plans of subdivision.

The text of this amendment is attached as Annex B. The amendment creates a new appendix, Appendix F, Guidelines re Energy Conservation Measures in Plans of Subdivision. The appendix provides more precise information on factors to be considered during the subdivision review and approval process to determine compliance with the new energy conservation policies.

Small new projects within existing urban areas are not subject to this policy because the necessary flexibility with respect to street orientation may not exist in urban infill situations. The policy is not applied to country lot subdivisions because the size of these lots (0.8 to 10 hectares) is sufficient to permit proper orientation and solar access, and transit service is not provided.

Implementation of the Energy Conservation Measures

Energy conservation measures in subdivision design may be either voluntary (encouraged) or mandatory. For each measure an approach could be adopted ranging from information distribution to incorporation in the Regional Official Plan as a guideline or as a mandatory requirement.

The development industry is aware of the increasing importance of energy efficiency to consumers. HUDAC recently announced an Energy Saver Program which allows participating builders to advertise and promote their new homes as energy efficient if they install basic energy-saving features. The Canadian Electrical Association and its member utilities have a similar program, the Energy Efficient Home Program.

The concept plan submitted by Campeau Corporation in support of their application to amend the Official Plan to permit development of the Lakeside area in Kanata has a brief section devoted to energy. Energy conserving features cited for the plan included walkways, orientation of lots to the sun and preservation of coniferous trees to provide windbreaks.

The selected approach for implementation of energy conservation measures in plans of subdivision is to amend the Regional Official Plan as discussed above. Copies of Appendix F, which provides more detailed guidelines for assessing conformity to the energy conservation policies of Amendment 34, have been included in the subdivision

application package distributed by the Planning Department. As Appendix F is not part of the Official Plan, the guidelines may be easily amended from time to time as everyone learns from experience.

Each report prepared by planning staff on subdivision proposals should explicitly report on the degree of compliance with the energy conservation measures.

This approach to implementation permits the measures to be applied flexibly in response to differences between sites. It also provides Council with explicit information on the degree of success attained on the incorporation of energy conservation measures into plans of subdivision and the trade-offs involved.

4.5 Provision and protection of solar access

Section 3.4 discusses minimizing the heating and cooling requirements of a structure by climate sensitive design.

This section discusses solar heating and new planning requirements which might be implemented if municipalities wish to encourage use of solar heat by ensuring solar access.

4.5.1 Background

Solar Heat Gain

Windows, even double or triple glazed ones, have much less thermal resistance than walls, which means they are a major source of heat loss. But windows also contribute to heat gain whenever they receive direct solar radiation. In fact, "over the length of the heating season south-facing double or triple glazed windows are net gainers of solar radiation at all points in Canada".[1] An unshaded south window conserves more energy than even the most super insulated wall. It has been estimated that passive solar gains through windows in the existing Canadian building stock account for 12.5% of the gross annual residential heating requirement.[2]

Solar Systems

Use of solar energy for space heating is commonly divided into two general approaches, active and passive. In active systems, collection and storage components are separated and mechanical energy is used to transport heat (e.g. fans and pumps). In passive systems, collection and storage are integral to the building (i.e. solar energy is collected through south-facing windows and stored in the mass of the building such as brick walls and concrete floors). Thermal energy flow is by natural means, convection, conduction and radiation. Systems which combine active and passive elements are termed hybrid.

The mechanical components of active solar systems are still being perfected. At present the high initial cost of active systems (perhaps $10,000 or more) cannot be expected to be recovered through reduced heating bills within an anticipated 20 year lifespan for the system. (However, lower costs for do-it-yourself systems may make them economically feasible.) Because of greater mechanical complexity active systems are more prone to breakdown.

Passive solar features when incorporated in a house during construction are generally lower in cost and require only materials (e.g. windows) and construction skills which are widely available. Some forms of passive systems, such as attached greenhouses, are also suitable for retrofitting to existing houses.

Current indications are that solar hot water heating may also be technologically and economically feasible in most Canadian loca-

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[1] Passive Solar Heating in Canada: A Discussion Paper, Report ER 79-6, Ministry of Energy, Mines and Resources. 1980. p.33.

[2] Ibid p.2

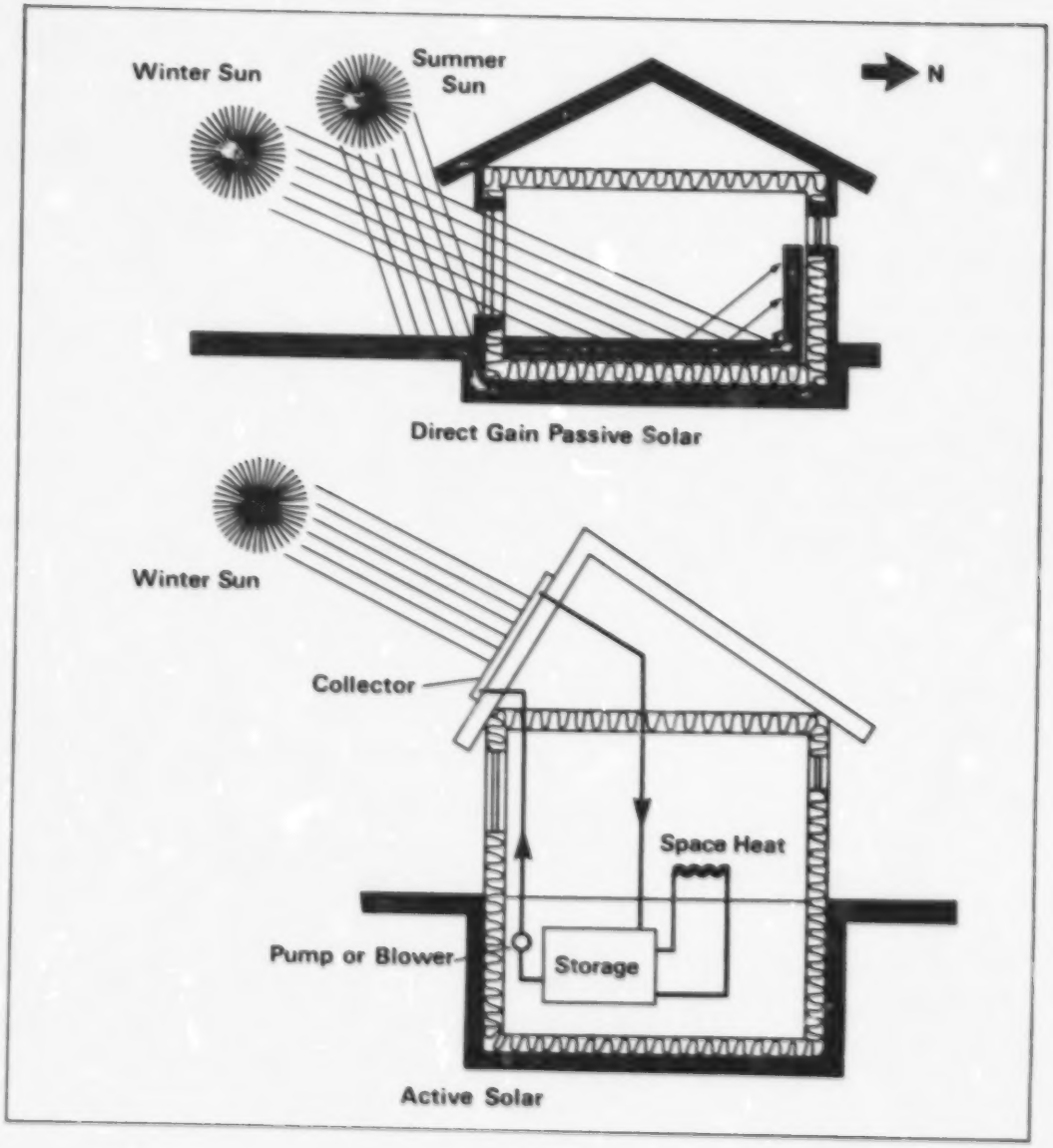
tions. The economic practicality of such systems is aided by the fact that solar input is utilized year-round, unlike space heating systems where the energy requirements are highest when the amount of available solar radiation is lowest. Moreover, solar water heating systems typically require a smaller area of collector plates than space heating systems, thus reducing initial costs.

Solar systems seldom provide 100% of total heating requirements. Heat storage capacity sufficient to carry a house through the months of December and January when the days are shortest and coldest, including the possibility of a series of cloudy days, is not a cost effective investment. Moreover, most lenders require that solar homes have a back-up conventional heating system.

Solar Access

There are several possible levels of protection of solar access. The three principal alternatives are rooftop access, south wall access and south lot access. Rooftop access, generally used for active space heating systems and solar water heating systems, is fairly easy to protect in any area where all the buildings are roughly the same height. South wall access requires greater separation between buildings, but permits passive solar gains to be made. South lot

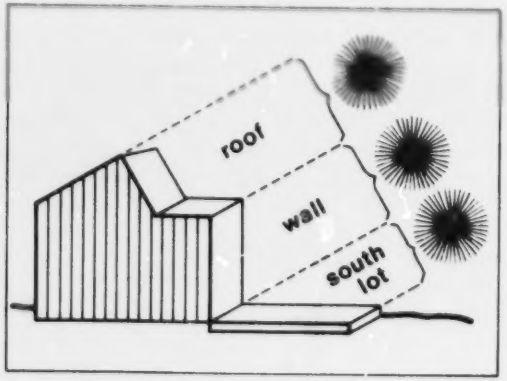
Fig.15



access provides the greatest degree of flexibility for utilization of solar systems but is the most difficult to ensure.

South wall access is recommended as the most desirable level of protection. Such access permits the use of passive solar systems which are presently cost effective. Moreover, protection of south wall access also guarantees rooftop access, thus permitting eventual use of active systems.

Fig. 16
Levels of Solar Access



4.5.2 Planning Controls and Solar Access Protection

Subdivision Approval

There are a number of further measures which the Region might implement in the context of the subdivision approval process, if it wishes to provide greater assurance of solar access. These measures would require the co-operation of the affected area municipalities, because the solar access provided in the subdivision design would require protection by an appropriate zoning by-law.

Provision of solar access is best tested by use of shadows diagrams. A shadow diagram projects the shadow cast by a specified structure over an entire day in a specific location. Calculation of shadow diagrams is a time-consuming process as a different one must be constructed for each change in building dimension, slope or orientation of site and chosen date.

A decision would also be required as to the desired level of solar access. One study prepared for the Ontario Ministry of Energy utilized a standard of a minimum of four hours of solar access on January 21 and an optimum of six hours.[1] December 21 is not recommended as a design date for locations at 45° north latitude, because the amount of usable radiation (due to low solar altitudes) is too low to justify the restraints on neighbouring development required to provide solar access.

Use of shadow diagrams also requires either knowledge of or assumptions concerning the size and configuration of buildings to be constructed in the subdivision.

Maximizing solar access requires careful attention to design. A study done for the Ontario Ministry of Housing concluded that the discipline and forethought imposed by planning for energy conservation in site layout actually lowered site development costs.[2]

Design options for maximizing solar access include innovative lotting schemes and more flexible building setback standards. A proposed innovative lotting scheme to increase solar access for semi-detached units on north-south streets is shown in Figure 17. Examples of more flexible building setbacks include the zero lot line concept and permitting house building lines which do not parallel lot lines.

Advice on appropriate lot configurations to maximize solar access (narrow and deep versus broad and shallow) is contradictory in the present literature, apparently due to attempts to generalize. The best lot configuration can be expected to vary with the housing type. This matter will be considered on an individual basis as plans of subdivision are submitted for approval.

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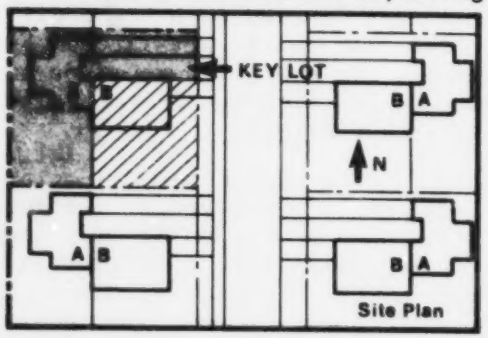
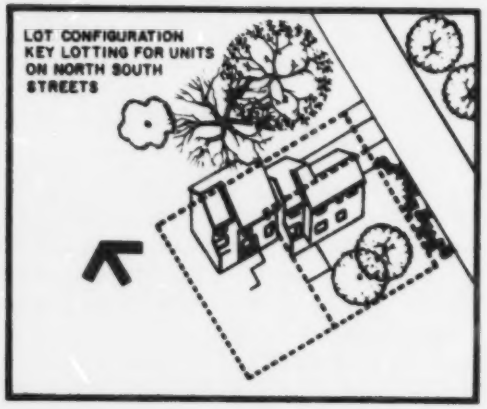
[1] Subdivisions and Sun: 3 Design Studies, Ont. Ministry of Energy, 1979, p.37

[2] Residential Site Design and Energy Conservation: Part 1 General Report, Ministry of Housing, Jan. 1981, p.14.

Fig. 17

Example of Innovative Lot "Key Lotting"





Lot for Unit A

Lot for Unit B

FROM: MINISTRY OF ENERGY, SUBDIVISIONS AND SUN

Finally the conditions of subdivision approval could require an agreement to maintain solar access. A restrictive covenant binding upon the developer and subsequent purchasers would prohibit construction on the affected land which would cast shadows on neighbouring structures. The covenant operates only within the subdivision. It cannot prohibit shading from development on adjacent lands.

Zoning By-laws

In Ottawa-Carleton, zoning by-laws are an area municipality responsibility (although they must conform to Regional and local Official Plans).

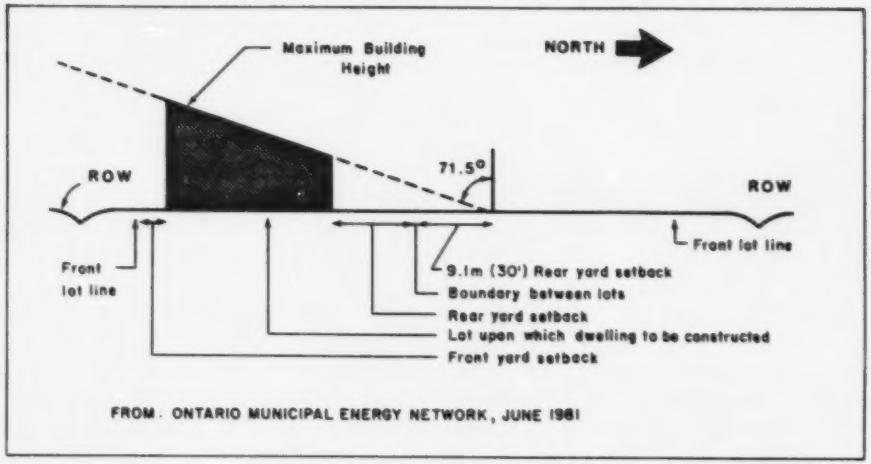
The Planning Act empowers local municipalities to pass zoning by-laws which regulate "the height, bulk, location, size, floor area, spacing ... of buildings or structures ... and the minimum frontage and depth of the parcel of land and the proportion of the area thereof that any building or structure may occupy." If a municipality chooses to do so, these powers are sufficient to ensure that buildings do not shade other buildings.

The City of Brampton has adopted Canada's first solar zoning by-law for a 20 hectare development comprising 650 units. The by-law was approved by the Ontario Municipal Board in July 1979. The objective was to ensure full south-wall exposure to direct sunlight between the hours of 9:00 a.m. and 3:00 p.m. during the heating season.

The by-law requires that the main wall face of a residential unit be aligned within 20 degrees of a true east-west axis. A height restriction plane was applied to lots on the north sides of east-west

Fig. 18

Application of Height Plane in Brampton Solar Zoning By-Law



FROM: ONTARIO MUNICIPAL ENERGY NETWORK, JUNE 1981

streets, based on shadow diagram calculations for a typical semi-detached unit measuring 50' x 50' x 25'. The application of the maximum height restriction is illustrated in Figure 18.

While a zoning by-law can be utilized to prevent shading by buildings, it cannot regulate shading by vegetation.

The setback requirements of zoning by-laws generally result in a building envelop which is deeper than it is wide. On the recommended north-south lots this could result in buildings with a north-south orientation. To avoid this, the Brampton zoning by-law requires that the long axis of a building be aligned within 20° of a true east-west axis.

4.5.3 Implementation

Plans of Subdivision

There are a number of unresolved issues which affect any decision to protect solar access. These include co-ordination with area municipalities, specifying standards for solar access, preventing shading by vegetation, and the future importance of solar heating.

Even using simplified methods, calculating shadow diagrams would involve additional time and cost for the developer and/or planning agency.

Co-ordination with the area municipalities is essential because they adopt zoning by-laws. The use of shadow diagrams to check south wall solar access in proposed plans of subdivision is only justified if the solar access is protected by an appropriate zoning by-law. Similarly innovative lotting schemes and flexible setback standards must be incorporated in the zoning by-law.

The desired standards of solar access (for example 70% of total dwelling units to have six hours of south wall solar access on January 21) must be jointly determined by RMOC and affected area municipalities.

Although solar zoning by-laws and restrictive covenants can prevent shading by buildings, there is no satisfactory mechanism to regulate shading by vegetation. Consequently full assurance of continued solar access cannot be provided.

Although immediate utilization of solar energy may not be great, the importance of future flexibility should not be discounted given the many uncertainties of energy supply and demand forecasts. Equally, however, the "glamour" aspects of solar energy should not be allowed to distort its importance in the total variety of measures available to conserve energy. Retrofitting and construction of new housing to higher standards of energy efficiency, though more mundane, are likely to yield greater energy savings over both the short and long-term.

RMOC does not require solar access protection in new plans of subdivision at this time. For now, the basic requirements are an east-west orientation for the majority of local streets in new plans of subdivision and the other measures dealt with in Regional Official Plan Amendment 34.

After two years of experience with implementation of this policy, a review will be undertaken. If at that time it is decided to require solar access, an arrangement can be worked out between RMOC and local municipalities to put into effect solar access protection by-laws.

In short, this report is suggesting a cautious experimental approach that can be built upon as experience is accumulated.

Existing Residential Areas

Zoning by-laws are currently the only planning control available to protect solar access in existing residential areas. The level of solar access protection appropriate for a given neighbourhood will vary with the degree of existing access, and in some instances, with the trade-offs between solar access and redevelopment to higher (more energy efficient) densities.

Solar access protection in existing residential areas is left to the initiative of the area municipalities.

5. OTHER ENERGY PROGRAMS

There are other energy saving programs in which the Region might participate. Action in these areas would generally implement the specific goals:

- to promote recycling and waste heat recovery programs
- to encourage innovation relating to efficient energy use.

5.1 Recycling

Recycling is the process of extracting useable materials from solid waste, including glass, metals and paper. Solid waste disposal is a direct cost to municipalities and new landfill sites are getting harder to find. Recycling can reduce the volume of disposal by as much as 25% and thereby reduce overall disposal expenditures. The potential energy savings for a community involved in recycling are expected to be the equivalent of 3.5 million gallons of fuel per 100,000 people.[1] In addition recycling usually creates new jobs in the community.

In Ottawa-Carleton, the area municipalities are responsible for refuse collection and RMOC is responsible for disposal (by sanitary landfill). Consequently both levels of government have a direct interest in recycling programs. RMOC benefits because the life of the sanitary landfill site is extended. The area municipalities benefit because they pay dumping fees for fewer tons of solid waste.

As the agencies responsible for refuse collection, the area municipalities have taken the lead role in promoting recycling. The City of Ottawa has a separate contract with Provincial Sanitation Services for the collection and recycling of newspapers. In addition, there are depots for the recycling of glass, tin, and used motor oil in the City yards. The depots are a pilot program which will be expanded city-wide if successful.

The Federal Government has been recycling paper from its offices in the National Capital Region since 1978. In recent years more than 9,000 tons of paper have been recycled annually.

Recycling reinforces the conservation ethic as well as reducing pollution and saving energy.

5.2 Heat from waste

Municipalities in Ottawa-Carleton produce approximately 600 tons of garbage and other wastes daily, most of which is landfilled. Much of this solid waste is combustible and could be used to produce heat through incineration, which in turn could be used where consumers or industry require large volumes of low grade heat or steam. At the present time, the cost of providing the facilities required to transport heat from centralized incinerators to low-volume consumers is the main economic impediment.

The Region of Hamilton-Wentworth with its solid waste reduction unit (SWARU) is one of the forerunners in waste reduction and energy generation in North America. The SWARU plant and its accompanying system of transfer stations allows the municipality to recycle metal substances as well as produce steam from other combustible wastes. Sufficient steam is now being generated that the operators of the plant and the Ontario Energy Corporation are finalizing arrangements for the development and operation of an electrical power generating facility supplied with the steam from SWARU.

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[1] Fuel For Thought: A Primer on Energy Management for Municipalities: Discussion Paper prepared by the British Columbia Ministry of Municipal Affairs and Ministry of Energy Mines & Petroleum Resources, p.26

Recognizing this constraint, but also the potential savings from waste heat, RMOC and the federal and provincial Ministries of Energy entered into a two-year $1,000,000 study to determine the feasibility of the conversion of the region's waste into 200,000 pounds of steam per hour and 10,000 kilowatts of electricity. The steam would be used to provide heat to federal government and private buildings in winter and to cool them in summer. RMOC is contributing $80,000 to this study.

The study will investigate municipal and wood waste fuel quantities and sources, environmental concerns, demand for steam and power, facility design, distribution systems and ownership and financing.

5.3 District heating

District heating is a system by which heat is supplied to a number of individual buildings from a central plant. Heat is available from coal or gas fired generating plants or from energy produced from renewable sources or solid wastes. Although common in Europe and particularly Scandinavia, district heating systems have had limited applicability in Canada, mostly heating institutional buildings. (The Department of Public Works operates a district heating and cooling system for federal government buildings in Ottawa.)

Barriers to development of district heating facilities in this country are institutional, administrative, technical, and financial.

To overcome these barriers, the Ontario Ministry of Energy, EMR, the City of Ottawa and three non-profit housing co-operatives are participating in a district heating demonstration project in Lebreton Flats. CMHC is co-ordinating and designing the system and the City of Ottawa will operate the facility. The project will demonstrate the operation of a low temperature hot water district heating system for residential applications. If successful, it will provide an experience base for assessing larger projects. This type of experimentation should be encouraged by RMOC and area municipalities. If the LeBreton project is successful, other locations and opportunities should be actively pursued by the Region and respective municipalities.

In addition, a district heating facility is proposed by the Cadillac-Fairview Corporation for an energy conserving community in the City of Kanata. The Ontario Cabinet, in its decision confirming the designation of this site for residential purposes, stipulated that a district heating system was one of several energy efficient features that are to be included in detailed planning for this area. However, development of the site as originally proposed is now questionable, given Cadillac-Fairview's recent decision to withdraw from the housing market in Ottawa-Carleton.

District heating systems have major advantages for energy conservation, fuel flexibility and environmental improvement. However they must also be able to compete on a cost basis with alternative sources of heat. In the short term the most economic sources of heat for district heating systems in Ontario are use of waste heat from conventional thermal generating stations or basic process industries and use of reject heat from nuclear plants. Beyond the short term the best prospect is co-generation (the combined production of electricity and thermal energy in a single plant). The result of co-generation is a slight loss in electric generating capacity, but a dramatic increase in overall plant efficiency from 33 to 80%. If in the distant future, a thermal or nuclear power plant is proposed for the Ottawa-Carleton area, opportunities for district heating could be investigated at that time.

5.4 Wood energy

A study has been prepared for the Ontario Ministry of Energy on the feasibility of wood as a source of renewable energy in eastern Ontario.[1] The study estimated the sustainable annual wood supply potential at several levels of delivered cost per oven-dried ton. It also reviewed technologies for converting wood to energy in the form of steam, electricity or methanol.

This analysis indicated that the development of a 9 megawatt cogeneration facility would be economically viable at present and that the production of methanol might be economically viable in the long term. Further investigation was recommended. The study also concluded that opportunities exist for increasing the use of fuelwood to heat commercial, institutional and residential buildings, but that development of a reliable fuelwood distribution and marketing system would be necessary to realize these opportunities.

In 1981 the Province of Ontario announced that 500 hectares of Crown land at Carlsbad Springs would be managed for the production of hybrid poplars. These poplars have high calorific values, i.e. they are good renewable energy resources.

The Region owns approximately 4,800 hectares at the Marlborough Forest which is managed by the Ministry of Natural Resources for forestry and recreation purposes.

5.5 Use of underground space

Buildings which are either underground or earth-sheltered have lower heating and cooling requirements because there is less exposed surface area for heat transfer.

The Mineral Resource Policies report prepared by the Policy and Program Division notes that Ottawa-Carleton is geologically suitable for underground mining of limestone. Underground mining has environmental advantages (less visual impact, noise, dust) but is more expensive than quarrying.

However, if the underground space created by mining is utilized (e.g. for warehousing or industry) the cost advantage swings to underground mining. Underground space including mining costs is much cheaper than conventional buildings on the surface.

Due to the constant year-round temperature of 10 degrees celsius (50°F) underground, heating and cooling requirements of an underground building are 30%-75% less than those of its above-ground counterpart.

In the context of establishing mineral resource policies, Regional Council adopted the following resolution concerning underground mining:

WHEREAS undergound mining of limestone permits extraction of resources otherwise sterilised by buildings, and

WHEREAS the space created by underground mining can be put to other uses and is less demanding in energy consumption, and

WHEREAS the advantages of utilising underground space have been demonstrated in other locations, notably Kansas City, and

WHEREAS it is advantageous to optimise the use of land in urban areas while also providing resources close to markets to reduce transportation costs, and

WHEREAS the region is geologically

[1] Wood Production and Conversion in Eastern Ontario Summary Report for the Ontario Ministry of Energy by Peat, Marwick and Partners, September 1982.

suitable for underground mining, and

WHEREAS staff of the Ministry of Natural Resources have made a presentation to Planning Committee to encourage interest in underground mining,

NOW THEREFORE be it resolved that the Council of the Regional Municipality of Ottawa-Carleton request the Minister of Natural Resources to undertake an underground mining demonstration project in the region to establish the cost of underground mining and the cost of preparing the space for utilisation, and to monitor the temperature, humidity and other factors of the underground space as may be appropriate in order to compare the energy consumption requirement of the underground space with that of surface buildings.

5.6 Implementation

Feasibility studies and demonstration projects related to the various energy programs mentioned in this section are currently underway. Further direct Regional participation will be contingent on the results of these studies.

At this time Regional Council has amended Section 5.6.5.1 "Garbage Disposal" of the Regional Official Plan to include direct reference to the desirability of recycling and waste heat recovery. The text of the amendment is attached as Annex B. The new specific goals listed in Section 3.2.3 of this report:

- to promote recycling and waste heat recovery programs

- to encourage innovation relating to efficient energy use

also relate to this section of the report.

6. COMMUNITY OUTREACH

A final and potentially the largest area of activity for a municipality is a community outreach program to encourage and assist householders, institutions and businesses to conserve energy. The role is largely one of information, motivation, education and assistance - often working in association with community groups and business organizations. Though the potential savings are enormous they usually are hard to measure since they accrue to the residents and businesses, i.e. the taxpayers, and not the corporation itself.

6.1 Rationale for community outreach programs

Community outreach programs are justified on the following grounds:

- it is a logical outcome of the government role of public leadership advocated throughout this report;
- it can maximize the effectiveness of the changes proposed in Sections 3 and 4 to Regional policies and provision of services. For example, the benefit of proper building orientation to be achieved in the subdivision approval process can be either wasted or maximized by individual choices in matters of house design and use, and lot landscaping;
- municipalities can provide a vital focal point for all kinds of energy related community activities and information;
- apart from pricing, community outreach is the only way to encourage conserving behaviors which are strictly matters of individual decision, e.g. thermostat setbacks;
- community outreach can provide a channel for feedback on the effectiveness and improvement of RMOC actions to conserve energy.

6.2 Approaches to community outreach

Many different elements or initiatives can be included in community outreach programs. If RMOC decides to develop an outreach program, experience in other municipalities can provide numerous useful ideas, however it is neither necessary or desirable to present them all in this report. Some of the more common elements include workshops or seminars on energy related topics, media campaigns (TV, radio, newspaper), advisory and referral services, distribution of published information, high-profile special events, and development of recycling projects.

There is already a great deal of attention being given to the topic of energy conservation in the home. It is doubtful whether further encouragement or general advice is needed.

The City of Ottawa does outreach on energy conservation, including publication of a regular Conservation Pipeline column in the local newspapers. More importantly, the City has received a Community Energy Management demonstration grant from the Province to fund its Energy Action Plan process. The process examined energy conservation in the residential sector during its first year and will move on to the commercial and industrial and the transportation sectors. Clearly this comprehensive effort has the potential to involve a wide cross-section of the community. There is no merit in duplicating this work.

Community outreach efforts for RMOC initially consisted of promoting extensive circulation and public discussion of the draft of this report. Informal comment and input was encouraged in addition to the public hearing for the proposed Regional Official Plan amendment. Such input helped determine energy policies for RMOC.

As the public discussion did not indicate community support for other outreach activities, a community outreach program was not recommended or approved.

It is anticipated that some of the issues raised in this report will be the subject of further discussion in the context of the Official Plan Review.

annex A

COUNCIL RESOLUTION OF 26 SEPT. 79

MOTION NO. 209

Moved by Councillor B.V. Bourns,
Seconded by Councillor A.C. Loney,

WHEREAS in its decision concerning the Regional Official Plan the Cabinet of the Province of Ontario has included in the Kanata growth area the proposed subdivision by Cadillac-Fairview;

AND WHEREAS in making that decision, the Cabinet noted the "provincial significance" and importance of the "energy conservation features" contained within the subdivision proposal;

AND WHEREAS the Cabinet further noted that "proceeding with this energy saving project is a matter of urgency,.. (so that the) experience gained may be emulated elsewhere and result in substantial energy savings";

AND WHEREAS Council is in agreement that steps should be taken to reduce both current and future energy requirements of the urban area;

THEREFORE BE IT RESOLVED that the Planning Department be instructed to:

a) prepare a compilation of desirable energy saving features that may be included in subdivision plan including:

   i) improved insulation

   ii) reduction of exterior wall area by development of attached or buried housing forms

   iii) district heating

   iv) housing orientation, window size and location and landscaping features aimed at passive solar heat gains

   v) active solar heating

   vi) decentralization of commercial and community facilities to reduce travel distances

   vii) street layout to encourage use of transit

   viii) proximity of employment

   ix) development of separated walking and bicycle paths to discourage car use for local travel

   x) such other features as the department may consider desirable

b) report this listing to Regional Council for review prior to distribution to municipalities and developers to encourage the incorporation of these energy saving features in new communities and buildings.

c) develop suitable guideline for new subdivisions to ensure regional and provincial interests in energy conservation are maintained.

d) review the Cadillac-Fairview proposal to ensure it contains all the energy saving features reasonably possible.

MOTION NO. 210

Moved by Councillor E.M. Stewart,
Seconded by Councillor B.V. Bourns,

Resolved that Motion No. 209 be amended by adding a clause "E" to read:

(e) "Request information on procedures that could be used to achieve these measures".

"Carried"

annex **B**

REGIONAL OFFICIAL PLAN AMENDMENT 34

1. Purpose

When the Regional Official Plan was prepared during the early 1970s, energy was not perceived as a major problem or public issue. Consequently, energy is not directly addressed in the Plan. It is now clear that the type, supply, and cost of energy will be a major influence on future urban development.

This amendment to the Regional Official Plan will provide an explicit statement of Council policy on this important matter. The amendment establishes energy conservation as a Regional goal and states policies which Council will implement to increase energy efficiency. It also adds an appendix, Appendix F, Guidelines re Energy Conservation Measures in Plans of Subdivision and Plans of Condominium which provides more detailed information on matters to be considered during the plan review and approval process to determine compliance with the energy conservation policies of the Regional Official Plan.

2. Background

This amendment to the Regional Official Plan is intended to reflect Council's recognition of the finite supply of present conventional sources of energy and the burden which rising energy costs place on governments, businesses, and individuals. It is both necessary and desirable to utilize energy more efficiently and conserve wherever possible. Energy conservation will be implemented in both municipal operations and the approach to development of the community.

Energy is considered important enough to be added as a major goal area to Part I of the Regional Official Plan. Specific goals indicate Council's intent to achieve energy efficiency in the areas of municipal operations, land use patterns, transportation and solid waste disposal and to be supportive of demonstration projects to test innovative ideas in the area of energy conservation.

The transportation policies of the Plan, especially the public transit policies, are already compatible with the goal of energy efficiency in transportation. The amendment contains policies to explicitly state Council's concern with energy efficiency in patterns of land use and in solid waste disposal.

3. The Amendment

1. Section 1.4, Priorities and Goals, second paragraph is hereby amended by deleting the word "six" and substituting the word "seven" and by adding the words "conserving energy" to the listing of principal areas of concern following "developing economic opportunity".

2. Section 1.4, Priorities and Goals, third paragraph is hereby amended by deleting the word "six" and substituting the word "seven".

3. Table 1.1, Goals for the Region, is hereby amended by adding a seventh category, Energy, as follows:

(7) Energy

Major Goal

- To develop the Region in a manner which uses energy efficiently and maximizes energy conservation wherever possible.

Specific Goals

- To achieve energy efficiency in municipal operations.
- To develop energy conserving patterns of land use.
- To maximize use of energy efficient modes of travel, such as public transit, walking and biking.
- To promote recycling and waste heat recovery programs.
- To encourage innovation relating to efficient energy use.

4. Section 2.4.1 (ii), Urban Residential Communities, New Residential Districts, as amended by OMB Order Nos. 62 and 63 and by Amendment 17 is hereby amended by adding the following as a fourth point in the second paragraph:

   - "the development of energy efficient patterns of land use including provision for efficient and attractive transit service in proximity to dwelling units and commercial, industrial and institutional uses, provision for pedestrian and bicycle travel, and subdivision design which optimizes solar access and minimizes travel needs."

5. Section 2.4.1 (ii), Urban Residential Communities, New Residential Districts as amended by OMB Order Nos. 62 and 63 and by Amendment 17 is hereby amended by deleting the fourth paragraph.

6. Section 2.4.1 (ii), Urban Residential Communities, New Residential Districts, as amended by OMB Order Nos. 62 and 63 and by Amendment 17 is hereby amended by deleting point (6) and substituting the following:

   (6) When approving or considering local official plans, secondary plans, development plans, plans of subdivision plans of condominium and severances or amendments to one or more of them, Council shall ensure that the proposed plan encourages energy savings by providing good opportunity for developing south facing buildings and minimizing auto travel needs by provision of safe and convenient pedestrian and bicycle routes.

7. Section 2.4.1 (ii), Urban Residential Communities, New Residential Districts, as amended by OMB Order Nos. 62 and 63 and by Amendment 17 is hereby amended by deleting point (7).

8. Section 3.1.3.4, Council's intentions re Public Transit, is hereby amended by adding the following as point (3):

   (3) When approving or considering local official plans, secondary plans, development plans, plans of subdivision, plans of condominium and severances for development within areas designated principal urban area on Schedule A or amendments to one or more of them, shall ensure adequate provision for the efficient delivery of transit service to within approximately 400 metres of virtually all residential uses and within approximately 400 metres of all commercial, industrial and institutional uses.

9. Section 5.6.5.1, Garbage Disposal is hereby amended by deleting the section and substituting the following:

   - "A further concern of Council is that adequate provision is made for the disposal of solid wastes. Disposal of garbage and other solid wastes is a regional responsibility, while collection is a responsibility of the area municipalities.

   - The Region operates a sanitary landfill site on Trail Road in Nepean as the main disposal site for the urbanized area.

   - Separation and recycling of materials such as paper, metals and glass can conserve valuable resources, save energy, create jobs and reduce pollution. Alternatively, municipal garbage and other solid wastes can be burned and converted into steam and electricity. Both recycling and heat recovery reduce the volume of solid waste to be landfilled, thus

reducing municipal costs and extending the life of sanitary landfill sites.

Council therefore:

(1) Shall make adequate provision for the disposal of solid wastes.

(2) Shall promote recycling as a way to reduce municipal costs, minimize environmental degradation and conserve energy.

(3) Shall investigate and, if feasible, co-operate in the construction of a solid waste-fired energy recovery facility.

10. Add Appendix F as an appendix to the official plan for the purpose of information only:

APPENDIX F

GUIDELINES RE ENERGY CONSERVATION MEASURES IN PLANS OF SUBDIVISION AND PLANS OF CONDOMINIUM

The various matters discussed below will be considered as appropriate in the review of plans of subdivision and plans of condominium. It is recognized that all of the matters are not equally applicable to the various kinds of plans or even to every proposal within a certain category. As an example, provision of neighbourhood facilities and of collector roads to carry transit may be irrelevant to a small subdivision proposal.

When assessing conformity with the policy in Section 2.4.1 (ii) 6 which requires 'good opportunity for developing south facing buildings', the following matters will be considered:

1. Street Orientation

The preferred orientation for local streets is within 25 degrees of a true east-west axis. It is recognized that there is less flexibility for the location of collectors and arterials.

2. Lot Orientation

Lots oriented within 25 degrees of a true north-south axis will be considered to provide good opportunity for developing south-facing buildings. It is anticipated that at least 65% of the lots on local streets will have the desired orientation.

Orientation east of south is preferred to orientation west of south, (morning sun is desirable to warm a house which has cooled over night; afternoon sun may contribute to over heating).

Use of slanted lot lines may achieve the desired orientation of lots when the street orientation is unsatisfactory.

3. Location of Higher Density (taller than 3 storeys) Development

Blocks of land intended for higher density (taller than 3 storeys) development should be located to minimize shading of lower density development.

In some instances a location which minimizes shading may not be the best location with regard to transit and other forms of travel. In this case transit considerations should prevail.

4. Other

Other methods, such as innovative lotting schemes, will also be considered when assessing the provision of solar access. The emphasis is on the provision of south wall solar access, not on any particular technique. Generally, north-south separation between buildings approximately equal to that provided by use of east-west streets will be satisfactory.

Orientation requirements will not be applied to plans on north-facing slopes of 5% or greater.

Use of attached housing types in locations where satisfactory orientation is not possible will be considered a positive feature in assessing proposals.

Constraints such as topography (e.g. ravines) and parcel configuration will be recognized in the assessment of solar access provision.

When assessing conformity with energy conservation policies with respect to transportation in sections 2.4.1 (ii) 6 and 3.1.3.4 (3) the following matters will be considered:

1. Provision of neighbourhood facilities

   Neighbourhood facilities include both commercial and community uses (schools, parks, daycare centres). Both provision for these uses and their relative locations within proposed plans of subdivision will be considered within the context of any relevant local official plan, secondary plan, or development plan policies.

2. Transit

   The adequacy of provision for transit will be assessed by the Regional Transportation Department, using the "Transit Servicing of New Urban Areas: Guidelines for Development."

3. Pedestrian and Bicycle Facilities

   Where available, requirements for pedestrian and bicycle facilities in proposed plans of subdivision will be based on overall plans for such facilities in local official plans, secondary plans or development plans. In the absence of overall plans, proposals will be examined for opportunities to reduce trip lengths to destinations such as schools and neighbourhood commercial facilities by provision of key links or use of the open space system.

annex C

TRANSIT SERVICING OF NEW URBAN AREAS **GUIDELINES FOR DEVELOPMENT**

TRANSPORTATION PLANNING DIVISION TRANSPORTATION DEPARTMENT RMOC. DEC. 1981

This paper provides a brief overview of the importance the Regional Municipality has placed on the continued improvement of transit accessibility for new urban areas and, in particular, discusses the guidelines currently in use in the approval process of new subdivisions. In general, the Region does not set out specific standards of accessibility in these conditions of approval; however, specific conditions for each development are set to ensure that a high level of transit service can be provided at all stages of development.

In the development of these conditions of approval, a standard for walking distance from all buildings to transit stops is applied as follows:

- Maximum	400 m
- Desirable	300 m

By requiring that activity centres and higher density development are placed as close as possible to the transit service, average walking distances to transit are minimized. It is generally desirable to have about two-thirds of the potential catchment within 200 metres of transit stops. On occasion, it may be necessary to slightly relax the maximum walking distance standard in relation to infilling development where the constraints of adjacent existing or previously approved developments limit the provision of transit routings to achieve the desired accessibility. In these situations, lands in excess of the maximum walking distance should be limited to low density development.

The bulk of new development proposals requiring special provision for transit are residential and industrial subdivisions in newer urban areas, and specific conditions related to transit servicing are developed for each development. These conditions essentially fall into two categories:

a. Operational.

b. Level of Service.

Under the operational category the conditions are now almost standardized and include:

a. The requirement for adequate construction depth for transit vehicles on streets identified for possible transit usage.

b. Suitable roadway geometrics to accommodate bus turning manoeuvres.

c. Provision of sidewalks on at least one side of the street carrying transit.

d. Provision of paved passenger standing areas at all potential bus stop locations. (The developer is provided with these locations prior to or at the draft subdivision stage.)

e. Orientation of buildings and private accesses adjacent to bus stops.

Under the level of service category, specific conditions are made in the following areas:

a. The location of all roadways to maintain high transit accessibility.

b. The provision of paved all-season walkways through open areas and between streets to minimize walking distances.

c. The provision of transit-only roadways.

d. The distribution of land uses.

e. The developer must enter into an agreement with the Municipality regarding the staging of development. These agreements, which also take into account automobile needs, may include a required sequence of construction, temporary roadways for transit access and the completion of essential roadway links prior to habitation of particular phases, plus any other measures that may be appropriate.

In general, the conditions applied to a subdivision do not imply any major changes to a developer's proposals, as developers are invited to contact us at an early stage of developing their proposal to ascertain the conditions that would be applied with regard to transit servicing. In reviewing these preliminary proposals from developers, recommendations may be made requiring major changes in the distribution of land use, internal roadway locations and the provision of transit-only roadways or similar measures, and comment on the form that an agreement for staging would take.

Although a standard of accessibility other than that previously stated is not applied, the following principles in determining what modifications are appropriate to providing efficient and attractive transit service to the development are used:

a. Minimize overall walking distances by:

   (1) appropriate location of the collector roadway system to be used by transit;

   (2) provision of paved walkways:

   (3) placing all high-density developments on the streets serviced by transit; and

   (4) placing all medium density developments on streets carrying transit, or in closer proximity to such streets than low density development.

b. Minimize the number of streets in which transit service is provided.

c. Concentrate as many transit routes as possible on the same street, to provide the highest possible level of service in terms of headway to all users.

d. Minimize transit route lengths through the development by providing a collector road system that permits as direct as possible routings in the orientation of heaviest demands.

e. Link sufficient neighbourhoods by one service to ensure that attractive headways can be efficiently provided during both the peak and off-peak periods.

f. Develop a transit route structure that lends itself to the minimum number of routing changes through the development stages.

Benefits to be realized by applying these conditions are only starting to become evident, as such conditions have only been introduced to any significant extent during the last few years.

With regard to transit ridership, the Region is confident that by providing a high level of transit service from the initial stages through to final development, dramatically higher transit ridership will be achieved than that currently exhibited in the established auto-oriented developments within which transit services have traditionally had to operate.

Also, the provisions made for more efficient transit servicing, in terms of minimizing the internal travel distance within the developments, will result in lower operating costs and improved fuel utilization.

As a minimum, these conditions should eliminate most of the costly transit operating problems that can occur if staging conditions for efficient transit routings are not considered. Ill-timed minor street closures could potentially result in excessive increases in transit walking distances and even elimination of viable servicing.

It is stressed that this is but a brief overview of current treatment of transit accessibility in new urban areas. This office would be pleased to address inquiries if further clarification is required.

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